a journal for precision engineers and all users of industrial diamonds and other hard materials

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MICROSTRUCTURES OF DIAMOND SURFACES

By S. Tolansky, D.Sc., F.R.S.

Read what the Reviewers say about this important book :—

This is a delightful book : firstly because it is a record of a piece of highly individual research by one school supervised and inspired by one man ; secondly, because it is superbly illustrated. Indeed, although the letterpress is easy to read, the ideas being clearly and simply expressed, it is probably the plates that will sell the book . . . Prof. Tolansky has developed new and very powerful optical techniques which actually reveal and enable him to measure surface steps or discontinuities of as little as 10 A., the effective useful magnification in such a case being X 500,000. . . . Cleavage, polishing, etching and sawing of diamond faces, octahedral, cubic, and dodecahedral, are all discussed in the light of really remarkable photographs, and some information is given on the difficult problem of " the two types of diamond."—Kathleen Lonsdale in " Science Progress."

Prof. Tolansky has been well served by the Goldsmiths' Press, whose wide experiences of diamond publishing has doubtless contributed to the success with which they have reproduced so many of his magnificent photographs of diamond surfaces. . . . Although all these methods are simple applications of well-known optical principles, it has remained for Prof. Tolansky to develop them into an extraordinary powerful array, needing skill to be sure, for their successful application, but comparatively little equipment beyond a good optical microscope to obtain one-dimensional resolution which compares favourably with that of the electron microscope. . . . The appearance of this book will be a welcome stimulant to many engaged in diamond research. It also provides valuable data for comparison with the artificial crystals of germanium and silicon, on which such an immense amount of effort is now being expended by the electrical industry. Since the stages of growth can actually be followed for these metals, comparative studies might well resolve some of the fascinating problems so literally brought to light by Prof. Tolansky's researches.—H. J. Grenville-Wells in " Laboratory Practice."

To those who use diamond as a tool, the information in the last two chapters, on " ring-crack " damage to diamonds, and on the surface condition of mechanically polished diamonds, should be specially worthy of study."—F. C. Franks.

Some of the traditionally accepted facts about diamond surfaces have been contradicted by Prof. Tolansky since he began studying the gem in his laboratory. His recent observations are described in " Microstructures of Diamond Surfaces." He reports, for instance, that tradition has it that diamonds have a perfect cleavage in particular directions. From optical studies of cleavage surfaces he says that " the cleavage is optically very far from perfect except in one type of diamond."—" Tooling and Production," Huebner Publications Inc.

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The Optical Techniques
Some Characteristics of Diamond
The Topography of the Natural Octahedron Faces
The Nature of the Trigons
Some Growth Features on Octahedron Faces
Linear Discontinuities on Diamonds (Slip ?)
The Etching of Diamond
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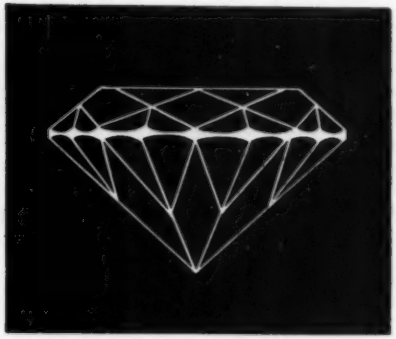

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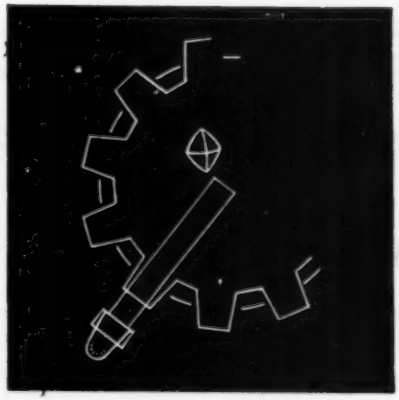

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Generally Speaking

Slicing and dicing

One of the most rapidly advancing fields of research and development at present is that of solid-state electronics—transistors and other types of semiconductor, and it is a field in which there is every reason to expect continued expansion. This was clearly demonstrated at the Transistor Exhibition held at Earl's Court last month, when most of the British and many of the Continental manufacturers and users of transistors and similar devices were showing their products. The use of new materials has necessitated the introduction of new techniques and the development of existing ones, and as many of these semiconductors are very hard materials, diamond machining has proved to be essential to their successful working. Sawing with conventional diamond-impregnated saws, either singly or ganged, is used for reducing the original crystals into suitable sized sections, and lapping with diamond abrasive material gives the necessary fine finish and accurate dimensions. Another use of diamond that is found in this field is less direct but no less important; the latest technique is the casting of, for example, germanium, in moulds made of synthetic sapphire. These moulds closely resemble watch jewels in form, and are prepared in the same way, being ground to form with diamond abrasive.

Natural and synthetic

The hardness of the semiconductors is only an incidental quality, and is, in fact, an inconvenience as it makes the working so difficult. The hardness of some of the other recently developed synthetic materials, the ceramics and the cermets, is an essential part of their make-up and is indeed the principal reason for their development. They, too, offer a promising field for the expansion of diamond machining, since their uses are so wide: ranging from the small pieces used as tool bits in the turning of metals, and friction inserts in heavy-duty clutches, where the heat generated is too great to allow the use of the woven type of facing material, to

the enormous conical heads fitted to space rockets and ICBM's. In all these uses, accuracy and finish are vitally important, and diamond tooling is consequently essential.

The natural hard materials are not being neglected however. New developments in quarrying and bench sawing of stone have both improved the quality and reduced the price of the product, and in both cases diamond saws have been an essential feature of the development.

ADAMANT

De Beers Chairman Announces New Diamond Products

—— New Diamond Grit and Drilling Material ——

At the Annual General Meeting of the De Beers Consolidated Mines on June 10, the chairman, Mr. Harry Oppenheimer, made a public announcement of two new types of diamond material being marketed by the company. He referred to the significant change represented by these new products, which, he said, have been introduced to meet the competition of synthetic diamonds. Mr. Oppenheimer said that large-scale tests had been undertaken at the Research Laboratory on natural and synthetic diamond grit in various grinding operations: 'These tests have shown,' he stated, 'that natural diamond grit is greatly superior to the synthetic product in metallic bonded grinding wheels, and also in the cutting disks which are now being used in the large concrete road and airfield programmes in the United States. It is claimed that synthetic grits are more effective than natural diamonds in resinoid bonded wheels. There must, however, be doubt about the significance of such claims on account of the widely differing results that are obtained under varying conditions. In any case, as a result of the programme which has been carried out in laboratories, we will shortly be in a position to market a new diamond grit specially prepared for resinoid bonded wheels. This grit will have a very much better performance than the grit hitherto supplied by us for this purpose. The work done in our laboratories in this field has been carried out in close cooperation with the Belgian Diamond Company (Société Minière du Beceka) which produces the greater part of the industrial diamonds used for abrasive purposes.'

At the same time that Mr. Oppenheimer was making his announcement to the Shareholders' Meeting, a spokesman of the De Beers Company, Johannesburg, was making a parallel announcement to representatives of the daily press and the trade journals. The value of natural diamond for specific industrial uses has been considerably increased as a result of recent researches carried out at the Laboratory. Research along the particular lines that have proved successful was stimulated by the marked success of synthetic diamonds for certain specific applications. As a result of these researches the competition from synthetic diamonds can be fully met by the natural product.

The two new products demonstrated were a new type of natural diamond grit for resin bonded grinding wheels, claimed to be 40% more efficient than any natural grit previously used, and diamond drilling material, which, prepared to specific shape and size required for particular diamond drilling operations, has proved greatly superior to any that had been used before.

The new natural grit is already being tested in the United States and elsewhere, and for 18 months or more a series of hundreds of experiments and tests has been conducted before the new grit was brought to its present degree of efficiency. Its chief use is expected to be in those industries which grind tungsten carbide tools. The principal difference between the old and the new is that the old grit consisted of solid, blocky particles, which, it has been found, had a tendency to break out of the resin bond, whilst the new grit has had the blocky particles removed and consists of friable, irregularly shaped particles, which break away gradually, leaving the bulk of the particle still firmly embedded in the bond. The new grit is being used only in resin bonded wheels and for metal bonded wheels the blocky particle will continue to be employed, as it has been established that where the operating pressures between the wheel and the workpiece are high, the blocky shapes are held more firmly in the tough metal bond, so that the full strength of natural diamond can be utilized.

The material being specially marketed for diamond drilling crowns will give the drills considerably longer life in prospecting and mining operations. As in the case of the new diamond grit, the process is one of selection, so that only the most suitably shaped diamonds for any specific drilling operation are used.

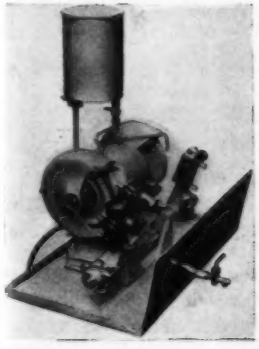
These announcements by the De Beers Company are of great interest to all users of diamond grits and drilling crowns, and the results of the commercial application of these new developments will be awaited with great interest.

Italian Ultrasonic Drills in UK

The Federici range of ultrasonic drilling and milling equipment is available in Great Britain from Airmec Ltd, High Wycombe, Bucks. Shown here is the 200-1,600 w drill with a support similar to that of a milling machine. The table is movable in three directions. Pumps for abrasive mixture and water coolant are coupled to the transducer which is governed by a high frequency generator; it transfers the high frequency vibrations from the generator to the tool. Hard and/or brittle materials—silicon, glass, synthetic stones—can be machined with ease, using a boron carbide, silicon carbide, aluminium oxide, or diamond powder abrasive. The size of hole obtainable depends on three variables: workpiece, abrasive, and wattage. Diamond chips or dust can be used on various materials, including tungsten carbide, and its selection and use depends on the type of work and finish required. It is worth noting that, when machining holes in diamond, the core can be retained for other uses.

For further details of this apparatus and its capabilities, write to Airmec Ltd, whose address is shown above, and ask for leaflet F. 500.

The 200-1600 w drill shown here can work with diamond or softer abrasives.



The Mark II Unicutta. The diamond-impregnated cutting disk is in the foreground. The machine is available from Cutrock Engineering Co Ltd, 35 Ballards Lane, London N3.

Rock Section Cutter and Grinder

The Mark II Unicutta is designed for technical schools and small laboratories requiring an inexpensive and compact machine for preparing geological specimens. A finely adjustable vice holds the rock specimen in the required position, and it is then pressed against the diamond-impregnated cutting disk and cut to the necessary depth. A second cut produces a thin slice which is mounted on a microscope slide and fitted on the arm in front of the grinding wheel. The section can then be ground to the thickness desired. Rock sections up to $1\frac{1}{4} \times 1$ in. can be produced.

Diamonds and Diamond Tools in the Metal Workshop*

by

Kurt Sterl

Continued from p 93, May

Grinding conditions

Diamond dust can machine the hardest materials for a very long time without deteriorating in sharpness. In dry grinding, the grinding dust of the material worked gradually sticks between the diamond crystals, and this causes smearing of the wheel (Fig 13*a* and *b*). When

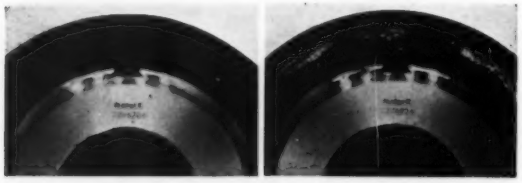
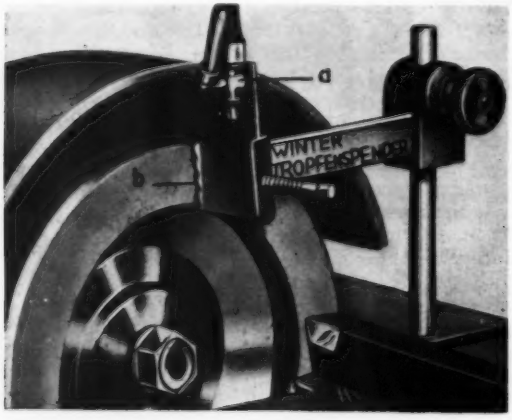


Fig 13a (left) a normal wheel; Fig 13b (right) a wheel which has smeared during dry grinding.

this happens, attempts are often mistakenly made to work with a greater grinding pressure. The result is that the diamond grain is torn from the bond too soon. It is a mistake to keep a quantity of coolant at hand and wet the wheel. It is even worse to rub the grinding surface with oil occasionally, for this only encourages the smearing of the grinding surface. It is better in these circumstances to grind dry.

Fig 14. A Winter lubricant dispenser attached to the grinding wheel.



If care has been taken to have the grinding dust removed at the moment it is formed, so that no smearing can occur, the wheel will remain adequately sharp and the length of life will be considerably increased. This is best obtained with a thin flowing, good wetting coolant, such as paraffin, or with special coolants prepared by several diamond tool manufacturers. In order to supply the fluid evenly on the rotating grinding wheel, a simple apparatus is used (Fig 14). An adjustable piece of felt is pressed against the wheel by a flat spring. The fluid is conducted through a valve from a supply tank in regularly timed drops. The circulation must be so arranged that the grinding area remains shining, wet, and clean. This type of drop dispenser can be attached to every grinding machine without difficulty. By its use an economical consumption of coolant is obtained and the wheel is kept wet without unnecessary spraying.

If a diamond wheel has become sticky, it can be cleaned again very simply by holding a stick of corundum against the revolving wheel, if it is bronze- or steel-bonded, or of pumice stone if it

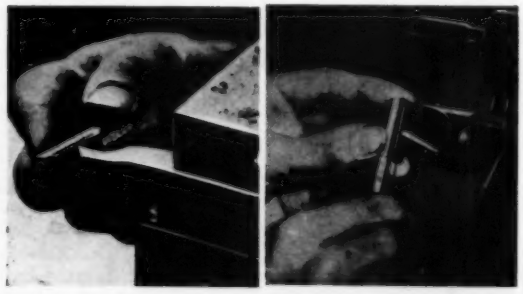


Fig 15a and b. Hand lapping tools used to sharpen tools which must not be removed from the machine.

is a synthetic resin bonded wheel. A few seconds will clean the wheel.

Diamond hand lapping tools

Diamond hand lapping tools (Figs 15*a* and *b*) have been developed for improved cutting in tools which are preferably not to be moved out of the machine. They are obtainable in every desired profile and are normally produced with synthetic resin or bronze bonds. They serve, as already said, for dressing wheels which have

become slightly blunt in cases where truing is not yet necessary, on cutting edges, or for getting rid of structural defects which might influence the surface finish of the workpiece or the tool life. They are also, however, useful in cases where diamond grinding wheels are not at hand and where it is not worth buying one for the purpose.

Diamond files

To facilitate machining or re-machining of hardened substances, diamond-impregnated files have been developed with which it is possible to work hard materials in the same way as when they are unhardened. These files consist of the

Fig 16. A selection of diamond files of varying shapes.

normal file body which is not hollowed out but impregnated thickly with diamond dust held in a special metal bond. The file is impregnated with diamond mesh size D 150 for rough work and D 70 for fine work. The files are manufactured for machine and hand use in all forms and sizes (Fig 16). In their use care must be taken to see that only a very light pressure is applied. Heavy pressure does not increase the rate of filing; it simply serves to tear the diamond from its bond. Filing machines are shown in Fig 17 and 18.

Fig 17. A file set up in the machine for use.

Fig 18. A file is held in the hand to file a turning workpiece.

Diamond saw wire

A tool similar to the file is the diamond saw wire with which it is possible to produce sintered carbide cutting blades from the solid. This method does away with the bothersome process of putting together several individual pieces (Fig 19). Diamond saw wire from 1.5 mm can be used on a file machine, if the machine is equipped with an attachment which gives the tool a rotation speed of 10,000 rev/min with the normal stroke movement of the file machine (Fig 20). Using this apparatus, a saw-cut length of 60 mm can be obtained in 150 min in a 3 mm thick sintered carbide disk, with a saw wire diameter of 2 mm.

Sawing and filing is done dry. The drilling for the entry of the saw wire in the sintered

Fig 19. A diamond wire saw in use.

carbide disk is done with a hollow diamond drill (Fig 21). This is a thin walled tube drill, the crown of which is set with diamond dust. Care must be taken here, too, to see that the work is done with only slight pressure and that the tool

is lightly lifted up at intervals. Long life of this tool depends on the removal of the drilling dust.

Diamond pastes

Until a few years ago loose diamond dust was widely used. This diamond dust served, and still serves, for grinding, polishing, or superfinishing hardened steel, sintered carbides, and other hard materials. The mass producers of diamond tools have nearly all turned to diamond paste manufacture. These lapping pastes are produced in mesh sizes D 100 to D 0.25, and can be had in applicators ready for use (Fig 22).

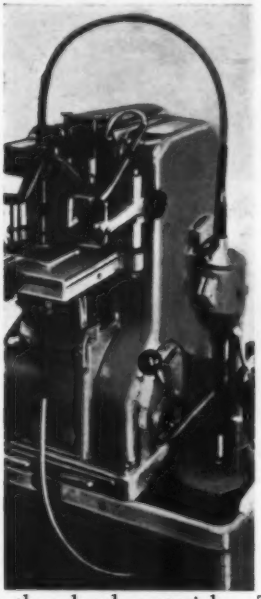


Fig 20 (Left). A file machine fitted with diamond saw wire.

Fig 21 (Below). Hollow diamond drill crowns for making the entry hole for a diamond saw wire.

If even greater quantities of material are to be removed, hard materials should be rough-worked with diamond grinding wheel, sticks, or files, as already discussed. If the workpiece surface is difficult to reach or does not merit the manufacture of the necessary diamond tools, the rough work may, in many cases, be done quickly with diamond pastes in mesh sizes 100 to 50 micron on suitable bases. The choice of the right base to carry the diamond paste is as important for the production of a good surface as is the choice of the mesh size. The bases can be steel, cast iron, brass, bronze, hard lead, copper, tin, plexiglass, wood, paper, silk, felt, velvet, or a variety of other materials. The important points in the choice of the base materials are form, pregrinding, the material to be worked, and the surface quality required on the workpiece. The base should not smear as a result of friction, and must hold the diamond particles firmly in its surface. For a high surface finish, hard base materials should be used, *eg* cast iron. Soft materials such as felt have the advantage that they give good contact with curved surfaces. In general, it can be said that for coarser mesh sizes the harder materials should be used, and for finer mesh sizes the softer materials. The form of the base depends on the workpiece surface and the ease with which it can be worked.

Diamond pastes are impregnated by pressing a very small quantity out of the spray tube on to the base or the workpiece, and then rubbing it and patting it gently over the surface before starting the lapping. The diamond particles then press themselves into the base so that in the course of time less and less diamond paste has to be added. If the paste becomes too thick owing to the accumulation of abraded material, and the grinding performance thus declines, the workpiece surface or the base should be sprayed with a thinner supplied by the diamond paste manufacturers. This cleans away the abraded matter, but not the diamond particles on the base.

Fig 22. Tubes of diamond lapping paste.

It is important to clean the workpiece to be worked with diamond paste both before and after each stage of the work, so that not a single particle is left over; for this purpose, water, spirit, acetone, or other suitable liquids are used. Every piece of apparatus to be used in the course of work must be scrupulously cleaned, for otherwise scratches may occur as a result of a coarser particle being pressed in during work with a finer mesh size.

It is also essential for every diamond mesh size to be used with a special base material, and for these materials to be clearly marked. It must be available and looked after so that it cannot come into contact with other diamond mesh sizes. When diamond pastes are used, surfaces can be obtained in a very short time which can

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otherwise hardly be achieved at all, or only after extraordinarily long working processes. With correct, economical use, 2 sq m of sintered carbide surfaces can be easily worked with 1 g of diamond paste. The diamond pastes serve best in the finishing of cutting and slicing tools of sintered carbide and steel, drawing dies, moulds, measuring and testing surfaces, rollers, shafts and bearings, pistons, cylinders, joints and tubes, and ceramic parts for chemistry and electronics. However, the use of diamond pastes is recommended not only for the production of the highest quality surfaces on tools, etc, but also for doing metallographic grinding in laboratories. The great hardness and sharp edges of diamond particles offer important advantages in metallographic grinding.

TABLE IV

Material	Grinding surface in sq mm	Brinell hardness	Polishing time with diamond	Polishing time with alumina
Tool steel	30 x 6	523	135 sec (30, 7, 3, 1 micron)	6.5 min (280, 3/0, 6/0 micron, alumina 1)
Sintered carbide (80% TC)	15 x 15	—	105 sec (30, 7, 3 micron)	Not polishable
Durochron hardened	15 x 15	425	240 sec (50, 15, 3, 1 micron)	12.5 min (280, 0, 5/0 micron, alumina 1)
Steel with 0.6% carbide	12 x 8	108	180 sec (15, 3, 0.25 micron)	12.5 min (280, 0, 5/0 micron, alumina 1)
Widia, by Krupp	16 x 3	—	150 sec (30, 7, 1 micron)	Not polishable
Alloy 'B' (Cu, Bi, sulphide)	20 x 10	—	150 sec (30, 7, 1, 0.25 micron)	About 90 min (280, 0, 3/0 micron, alumina 1)
Alloy 'C' (Bi, Cu, Mg)	18 x 10	—	135 sec (15, 3, 1, 0.25 micron, rotating)	Not polishable

The following disadvantages in alloys with additional materials of varying hardness are to a large extent avoided:

(i) relief formation,

(ii) removal of tough components in a brittle surrounding,

(iii) the falling out of brittle components in tough surroundings. In addition, the saving of time obtained by this method is astonishingly great, as can be seen in the table made by Professor Vogel of the Metallographical Laboratories of the University of Goettingen (Table IV). END.

Adolf Smekal

The death of Adolf Smekal, Professor of Experimental Physics in the University of Graz, occurred on March 7th, 1959. Translations of some of Professor Smekal's works have appeared in *Industrial Diamond Review*, and it is with regret that we have to record his death.

15,000 ft Diamond Core Drill

A diamond core drilling machine, capable of drilling to a depth of 15,000 ft or more, has been designed and will be manufactured by a Johannesburg engineering firm. The drill will be in operation in South Africa in September, and will be the first in the world capable of reaching such a depth.

Only a few years ago diamond drilling to a depth of 10,000 ft was exceptional. At the time there was little point in going further down since the problems of mining at such a depth had not been solved. Now, however prospecting is taking place in many parts of South Africa where gold had formerly been considered out of reach.

Guide to Carbide Selection

Hints on selecting carbides for different applications are contained in a free publication available from Adamas Carbide Corp, Kenilworth, New Jersey. Hints are given on countering effects of edge wear, cratering, chipping, and breakages.

Sintered Diamond-metal Tools for Machining Glass

by

W. Cegielski

Continued from p 75, April

Samples of the dust obtained by this method were pressed under a pressure of 3 and 6 t/sq cm and sintered at 1,250 and 1,300 deg C, in order to determine their hardness and structure. The hardness of the tested sintered masses was between 180 and 250 Brinell, and shrinkage between 9 and 13%. The microscopic tests showed that the sintered mass obtained from these powder mixtures had a fine grained structure consisting of fine, well-mixed tungsten and copper particles. In Fig 1 the microstructure of a sintered mass is shown, resulting from a reduced mixture of tungsten trioxide and copper chloride powders. Fig 2 shows the microstructure of a sintered mass made from a mixture of tungsten and copper powder.

The tests of cutting tools should be divided into two groups. First tests were made on small wheels, with a diameter about one-tenth of normal. One of these small wheels was hot-pressed in a graphite mould, a second cold sintered in a steel mould. These wheels were made to work at a speed of about 500 SFM, while normal glass cutters with a diameter of 400 mm turn at a rate of 850 SFM. The tungsten copper mixture, the manufacture of which has already been described, was combined with 7% diamond dust of a grain size 0.09 — 0.2 mm, thoroughly mixed, pressed, and then sintered.

Good working properties were shown by the wheels which were hot-pressed at a temperature of 1,180 to 1,240 deg C, as well as by those which were cold-pressed and sintered at a temperature of 1,220 deg Centigrade. The cold-pressed wheels worked for 250 hours.

Other tests were performed, substituting other hard powder substances for diamond dust. Silicon carbide, electro-corundum, boron carbide and crushed sintered carbide waste were used as substitutes. Their percentage representation in the metal powder mixture was 7%. As was to be expected the working tests showed the unsuitability of such sintered materials for working on glass.

Two matrix mixtures were used to manufacture large glass cutters with a diameter of 400 mm. One had 60% tungsten, and 40% copper (the production of these has already been given), and the second had bronze as its basic material; 7% diamond was added to the base.

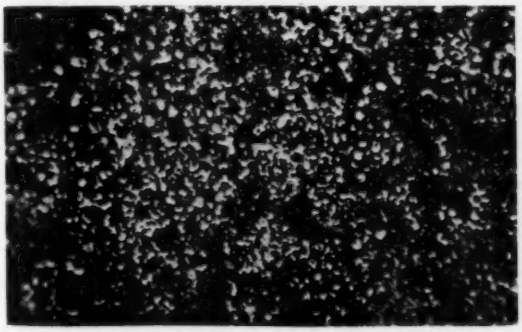


Fig 1. Magnified 0.725×.

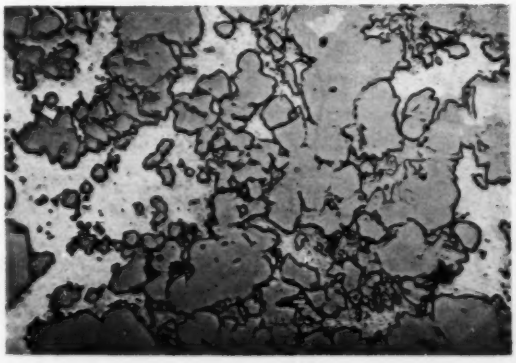
The pressed shapes were 4 mm wide, 1.6 mm thick, and formed the eighth section of a circle with a diameter of 400 mm. An additive of 2.5% glycerin was used as a lubricant.

The segments with a tungsten copper basis were sintered at 1,200 deg C for one hour, those with a bronze base at 700 deg C for 1½ hours. The segments were fixed to the steel disks, using a special clamp in order to prevent their losing shape.

The tests were performed in two industrial plants. In one the glass cutters were cooled during work with paraffin. The test results in this work were as follows:

a. The glass cutter with a copper-tin base worked well, the working life being 220 hours. It must be pointed out that the width of the diamond-metal layer was used up. The glass

Fig 2. Magnified 0.125×.



cutter was removed from the work because the diamond-metal layer had worn away at the sides. After the diamond-metal layer had reached the thickness of the steel disk, any further satisfactory work with the glass cutter became impossible.

b. In glass cutting with the tungsten-copper-diamond cutter sparks occurred and after 22 hours it was withdrawn from use.

In the course of tests in the second industrial plant, where a water coolant was used, less firmness was found in the soft solder (tin solder) which was used to attach the diamond-metal segments to the steel disk. Both glass cutters cut too slowly.

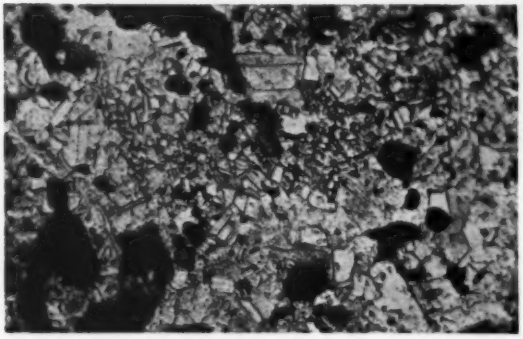


Fig 3. Magnified 350×.

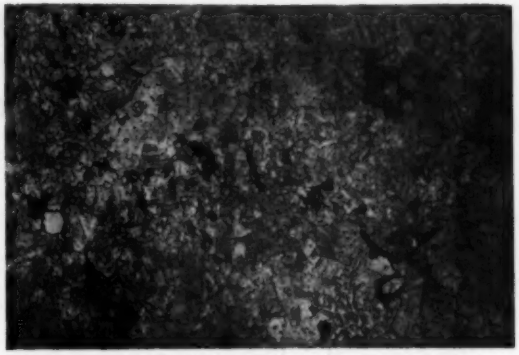


Fig 4. Magnified 350×.

Tests on the diamond-metal milling cutters

The tests were carried out on milling cutters which had an internal diameter of 28 mm and an outer diameter of 33 mm. Bronze (85% Cu, 15% Sn) was used as a basic bond for the diamond dust. The greater part of the tests was concerned with milling cutters which had been cold-pressed and sintered in a hydrogen atmosphere. Tests were also made with milling cutters which were hot-pressed in a steel mould.

As the diamond powder consumption was not to be too large, and as the diamond material was difficult to work, it was decided to make the milling part which was built into the holder without diamond dust. In order to balance or nearly balance the hardness of the two layers, the non-diamond layer was given more graphite powder.

The weight of the diamond layer was 10 g and that of the non-diamond 5 g (series I, II, III). In the following production series (Ip, IIp, IIIp), a weight of 8.5 g for both layers was used.

The changes in dimension were comparatively large in the sintered milling cutters, and in the extreme cases they

TABLE I.

The properties of the diamond-metal milling cutters tested in Factory A

L.N.	Series No	Diamond %	Graphite %	Average No of mm machined on a lens with a diameter of 50 mm	Average yield on the no of lenses (diam = 50 mm) during 8 hours' work	Average work capacity of a miller in hours
1	I	10	1	5076	350	—
2	II	10	1	2125	—	—
3	III	15	1	4104	—	—
4	III	7.5	1	2219	390	—
5	III	7.5	0	2158	—	—
6	Ip	7.5	0	1605	—	40
7	IIp	6.0	0	1208	550	30
8	IIIp	8.5	0	2727	—	57

hot pressed millers

TABLE II.

The properties of the third series of diamond milling cutters, tested in Factory B.

L.N.	Diamond %	Graphite %	Average time of milling a lens 1 mm thick in seconds	Wear of miller in milling 50 lenses. mm	Smoothness of the glass surface obtained by grinding
1	15	1	35	0.045	a little worse than
2	7.5	1	42	0.135	—
3	7.5	0	43	0.105	—

reached as much as 2.5% (up to 0.9 mm). The normal shrinkage was between 0.5 and 1.4% (0.2—0.5 mm). This is due to the varying ovality of the individual milling cutters which amounts to 0.15 to 1.5% (0.05 to 0.5 mm).

Figs 3 and 4 show the microstructure of the cold-pressed millers, both etched and non-etched. The figure 5 shows the photomicrograph of a hot-pressed miller after etching. The structure of this miller shows a greater density than the structure of the cold-pressed and then sintered millers.

The milling cutters of the Series II and III were sintered at 750 deg C for one hour, those of the Ip Series at 630 deg C, and those of IIp and IIIp at 660 deg C, for two hours.

Tables 1 and 2 give the properties of tested millers.

Comparative tests of the millers which were made against imported ones showed good properties especially concerning the productivity of the milling cutters. The tested milling cutters did not grow blunt during the work (showed the so-called self-sharpening). The imported milling cutters had to be sharpened, on the other hand, which causes loss of work and diamond dust.

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END.

New Research into the Truing Process in Grinding

by

G. Pahlitzsch *and* W. Thoeing

Continued from p 99, May

Comparison of the abrasive surface roughness before and after grinding

In order to establish whether the observed reduction in abrasive surface roughness during grinding occurs generally, the table speed and infeed in truing were changed, and, with otherwise similar conditions, the abrasive surface roughness was measured before and after grinding. The results were recorded in the form of 3-dimensional curves (Fig 2). It appears that at higher and medium values of table speed v_T and infeed a, the abrasive surface roughness is high before grinding and declines during grinding. With small sideways feed and infeed, on the other hand, the abrasive surface roughness is greater after grinding, and therefore increases during grinding. This phenomenon corresponds with the known process of self-sharpening: as a result of the strain of grinding the blunt abrasive grains split, so that new sharp edges are formed and the abrasive surface roughness of the grinding wheel increases. The abrasive surface roughness, plotted against table speed and infeed, forms a 3-dimensionally curved surface. The two surfaces 'before grinding' and 'after grinding' intersect in a 3-dimensionally curved line. The co-ordinations of this curve produce the truing conditions for which the abrasive surface rough-

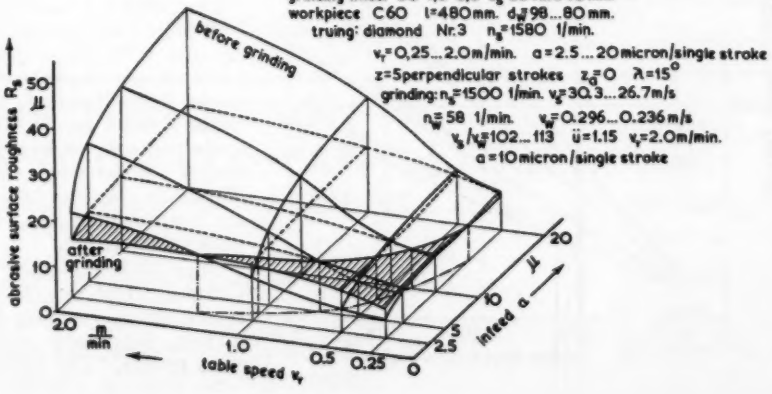


Fig 2. Effective roughness of grinding wheel before and after grinding with different truing conditions.
d_s = *wheel diameter*; l = *length*; d_w = *workpiece diameter*; n_s = *grinding wheel revs*; n_w = *workpiece revs*; v_w = *workpiece speed*;

$$ü = \frac{\text{width of grinding wheel}}{\text{sideways feed/workpiece rev}} \left[\frac{mm}{mm}\right] = [1] = \frac{\text{width of grinding wheel . workpiece rev}}{\text{table speed}}$$

ness is the same before and after grinding, *ie* at which the grinding process produces no change in the abrasive surface roughness. Check tests with these conditions confirmed this result.

Dependence of the abrasive surface roughness on table speed and infeed during truing

It was already apparent in Fig 2 that the abrasive surface roughness increased both with rising table speed and with increasing feed. Here the influence of the table speed is more marked than that of the infeed, which is evident from a comparison of Fig 3 and 4. If the table speed is increased threefold the abrasive surface roughness also increases threefold, while a similar rise in infeed causes a rise of about 1.5 to 2 times the abrasive surface roughness.

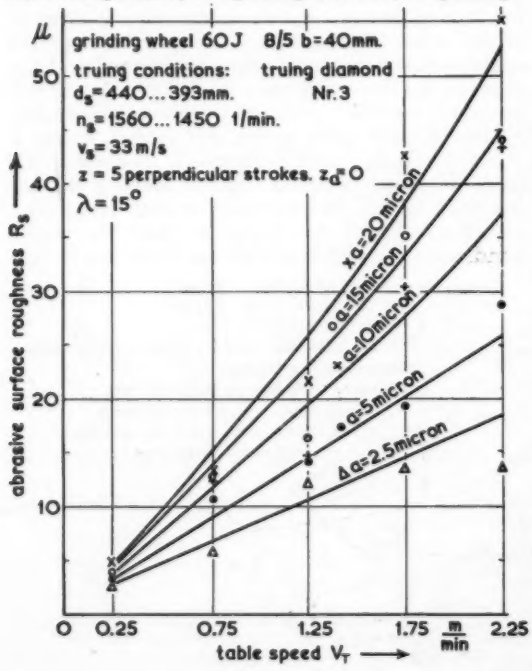
The relations can also be theoretically derived[3]. The following equation is found:

$$R_m = c_1 \cdot h \cdot \cot\beta/2 + c_2 \cdot a - c_3 \cdot \frac{a^2}{h} \cdot \tan\beta/2$$

Here R_m = theoretical abrasive surface roughness, a = infeed, $h = v_T/n_S$ = sideways feed or pitch of thread, β = side angle of the diamond, c_1, c_2, c_3 = coefficients.

The coefficients are approximately the same. As h lies in the region of 0.3 to 1.3 mm, while

Fig 3. Influence of table speed in truing on the abrasive surface roughness of the grinding wheel before grinding.



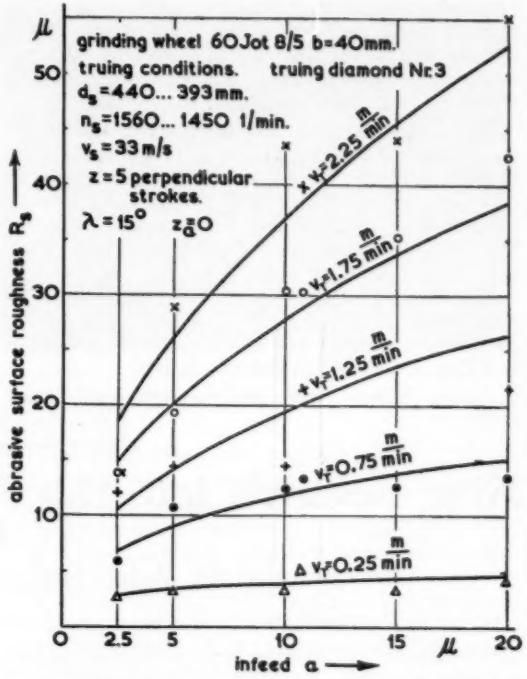


Fig 4. Influence of infeed in truing on the abrasive surface roughness of the grinding wheel before grinding. Experimental conditions: see Fig 2.

a = 5 to 20 micron, the stronger influence of the first part with the linear dependence of h (and also v_T), as compared with the second part (linear dependence of a), is easy to see. The third part has evidently only a slight influence.

Comparison of Igel diamond with single diamond dresser

Diamond is a very expensive working material. The price per unit weight rises considerably with the size of the single diamonds. There are truing tools on the market which, instead of having a single large diamond, contain a number of diamond grains set in a hard material. Such a tool contains, for the same price, a greater weight of diamond than a good single truing diamond. Besides this, these Igel diamonds are less sensitive and can be used up completely without re-setting.

Four Igel diamonds, of different forms and structure, and one single truing diamond were examined to see their influence on the abrasive surface roughness with different infeeds and table speeds. The tools were set radially to the

wheel (angle of inclination $\lambda = 0$). The results are represented as 3-dimensional curves in Fig 5 and 6. For all Igel diamonds the abrasive surface roughness at small table speeds and infeeds appears to be greater than with single diamonds. This is undoubtedly due to the fact that the single diamond was comparatively blunt and had a large surface, while the Igel diamond was being used for the first time, and therefore its diamond grains had sharp edges. With these tools the individual diamond grains rarely stand with their points far out of the bond. Thus at a small rate of infeed only one or a few grains actually cuts. Not until after much wear, that is a larger infeed, do more cutting edges come into use. Thus the number of thread grooves on the cutting surface increases, and the distance between the grooves becomes smaller. However, with the Igel with several layers of small diamond grains, the grains protrude only a little from the bond; even after a short period of use the wear is so great that at a large infeed rate the bond comes into contact with the grinding wheel and has a smoothing effect on the wheel. The more grains an Igel diamond has, and the smaller the grains are, the more the abrasive surface roughness obtained is decreased in comparison with the single diamond, at high values of table speed and infeed. The curve surfaces for the abrasive surface roughness in relation to the table speed and infeed are almost level with the single diamond, but more or less markedly inclined downwards with the Igel diamond.

Thus comparatively smooth surfaces can be obtained with such tools even at high table speeds, which saves truing time.

Continued on p 118

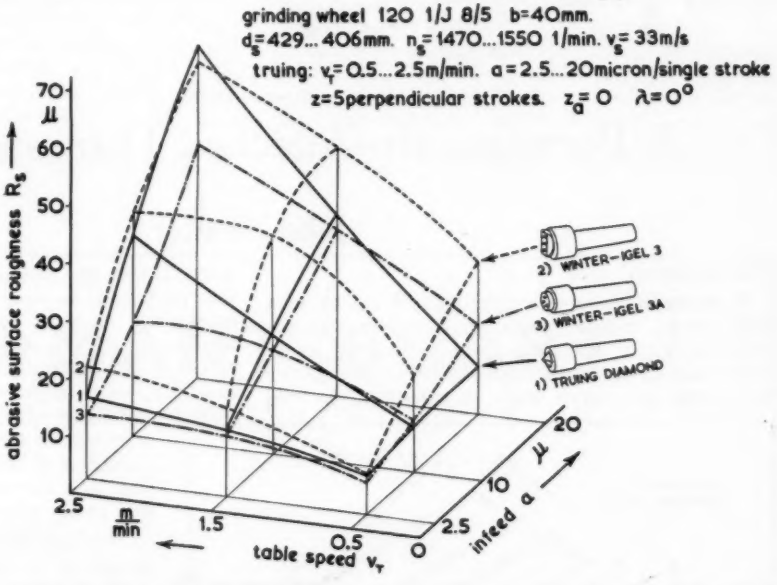

grinding wheel 120 1/J 8/5 b=40mm.
d_s=429...406mm. n_s=1470...1550 1/min. v_s=33m/s
truing: v_T=0.5...2.5m/min. a=2.5...20micron/single stroke
z=5perpendicular strokes. z_a=0 λ=0°
abrasive surface roughness R_s
70 µ 60 50 40 30 20 10
2) WINTER-IGEL 3
3) WINTER-IGEL 3A
1) TRUING DIAMOND
2.5 m/min 1.5 0.5 0
table speed v_T
20 µ 10 2.5
infeed a

Fig 5. Comparison of different Igel diamonds with a single truing diamond with reference to their influence on the abrasive surface roughness when there is a variation in thrust and infeed during truing. Experimental conditions: Grinding wheel: 120 I/J 8/5; b = 40 mm; d_s = 429 to 406 mm; n_s = 1470 to 1550 1/min; v_s = 33 m/s. Truing: v_T = 0.5 to 2.5 m/min; a = 2.5 to 20 micron/single stroke; z = 5 return strokes; z_a = 0; λ = 0°.

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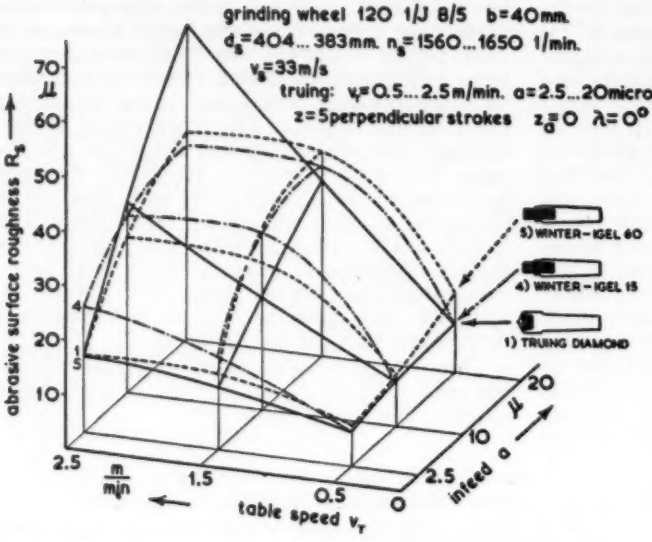


Fig 6. Comparison of various Igel diamonds with a single truing diamond with reference to their influence on the abrasive surface roughness when there is a change in thrust and infeed during truing.

Experimental conditions: see Fig 5, except for d_s = 404 to 383 mm; n_s = 1560 to 1650 1/min.

To be concluded

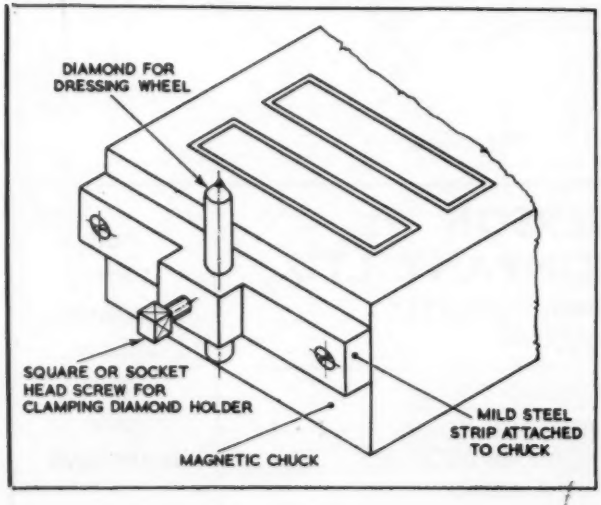
A Permanently Attached Diamond Holder

by

John Waller

The 'communal' truer

In every large production workshop, or in a tool room where there are several surface grinders busily operating on a variety of jig or press tool parts, considerable time is lost during the course of a week while an operator searches around for the communal holder supplied to that particular section, and as this time naturally multiplies week by week, the ultimate cost in lost hours is considerable and outweights the price of providing a diamond holder for each machine. A solution to this problem is seen in the illustration: a simple circular holder attached to a special steel holder screwed to the end of a magnetic chuck ensures that the diamond is always in position and ready when required.


DIAMOND FOR DRESSING WHEEL
SQUARE OR SOCKET HEAD SCREW FOR CLAMPING DIAMOND HOLDER
MAGNETIC CHUCK
MILD STEEL STRIP ATTACHED TO CHUCK

Production of the actual bars is simplified if the whole batch—one for each machine—is undertaken together: the milling or shaping of such details often allows the machining of three or four pieces at a single setting, and as the work is ideal for apprentices to perform the final cost per piece is low. Whether the centre thickening is adopted or a straight bar is used is a matter of opinion, but the former does perhaps possess a better appearance and takes but a few extra minutes to produce.

The design

Two screws hold the bar to the chuck,

and, as this means that the latter must be dismantled from the surface grinder for the tapping of the holes, the selection of a convenient time is essential in order not to interrupt the output from the machine. This is sometimes difficult in a tool room because the chuck is continually being used for the host of parts needed in tool production, whereas production grinders may often use a special fixture as an alternative means of holding the work, and the changing of these gives an opportunity to effect the above mentioned tapping operation. Drilling from the actual bar is the best way of ensuring that the centre distances are correct—the bar is really a drill jig, and slightly countersinking the holes removes all burrs and permits the bar to seat correctly when the screws are tightened.

Holding the diamond by a single screw is adequate unless the machine is a large one, and either a screw of the type depicted in the drawing or one of the socket head variety will supply the clamping pressure. A flat milled or ground on the diamond holder provides a seating for the screw and overcomes the tendency of a slightly damaged holder diameter to stick in the hole and so making adjustment difficult.

Because the grinding of thin components makes it necessary for the wheel to pass completely over the chuck, the diamond must, of course, protrude above the top surface of the magnetic chuck, otherwise a collision will occur with disastrous results to the wheel; there are two alternative methods of overcoming this problem.

An operator can remove the holder from the bar, but, as this rather defeats the object of the device, this idea is immediately ruled out as there is the possibility that the diamond would soon be lost. Secondly, and a much easier way of eliminating a collision, is to measure the distance from the table top to the spot where the holder will contact when pushed down into the hole. If the holder is then made about $\frac{1}{8}$ in. less than this figure, then every time the screw is loosened and the diamond pushed down, it will be retained in the holder but beneath the table surface, free from interfering with the passage of the wheel.

The introduction of this simple bar-type diamond holder to the magnetic chuck of a surface grinding machine overcomes the problem of searching for the usual type of holder when the wheel requires truing. Batch production of these bars is the cheapest method available for supplying a large grinding section.

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1959 Volume 16
JUNE

DIAMOND MINING AND INDUSTRY

Alluvial diamond returns for January 1959

Anon. *Diamond News* etc 1959 Vol 22 (6) pp 31-32 (Mar)

Rough and uncut diamond production in January 1959 for Cape Province : 7,217.50 ct of total value £60,830 (168s 7d per ct) ; Private Estates : 458.00 ct of total value £10,860 (474s 3d per ct) ; Transvaal Province : 11,998.00 ct of total value £34,222 (57s 1d per ct). Thus total production amounted to : 19,673.50 ct of total value £105,912 (104s 7d per ct).

M *Ebe F.13.361*

Acres of diamonds in the USA

M. B. Barr. *Diamant* 1959 Vol 2 (10/11) pp 5-7 (Mar-Apr) (In English, French, and Flemish)

A review of the history and occurrence of diamonds in the United States of America. Diamonds found range from 10 to 20/ct to an authenticated 40.23 ct stone. The two types of occurrence are isolated finds from secondary rocks or glacial moraine deposits, and from detrital matter derived from the weathering of crystalline-silicate rocks. The greatest number of finds have come from the Great Lakes area, and have been found in deposits brought down from the far north and left by the great continental glaciers. The only diamonds to appear in South African type volcanic rocks have been in 53 acres of Pike County, Arkansas. Activities of US diamond mining companies are briefly mentioned, and it is suggested that Canada and the US might have untapped sources of diamonds.

W *Eb.342*

The new regulation of the diamond industry in Liberia.
La nuova regolamentazione dell'industria diamantifera della Liberia

Anon. *L'Echo des Mines & de la Mét* 1958 (Dec) ; abstr *Industria Mineraria* 1959 Vol 10 (3) p 171 (Mar) (Original in French, abstr in Italian)

A short history of the industry up to the introduction of a regulation which authorizes the buying, selling, and export of diamonds. In 1957 Liberia exported 799,987 ct of which 780,445 ct were industrials.

M *F.25.2532.3674*

Research into uses of diamond grit

Anon. *Diamond News* etc 1959 Vol 22 (6) p 7 (Mar)

A new research company has been formed in Canada by South African diamond interests and Engelhard Industries. Called Consolidated Diamond Development Co Ltd, its main object will be to expand and develop uses of natural diamond abrasives.

W *F.25.343*

Basutoland may yield rich deposits of gem diamonds

Anon. *Diamond News* etc 1959 Vol 22 (6) pp 3, 5 (Mar)

Evidence indicates that sufficient diamonds have been recovered in Basutoland to justify development work which, it is suggested, one company is preparing to undertake. *W* *Eb.132.361*

Great year for Tanganyika mining

Anon. *SA Min & Engg Journ* 1959 Vol 70 Pt 1 (3449) pp 613, 615, 617 (Mar 20)

A review of Tanganyika mining activities, including diamond mining, in 1958. *W* *Hd.364*

U.S.S.R.'s expanding diamond fields

Anon. *Diamond News* etc 1959 Vol 22 (6) p 15 (Mar)

Pravda reports that diamond mining in Yakutia will be expanded in the next seven years to meet the needs of all Communist countries. Production in 1958 was eight times greater than in 1956, and production in 1965 will be 15 times greater than in 1958.

W *Hd.332*

The rebirth of a diamond city—Amsterdam

L. Asscher. *Optima* 1959 Vol 9 (1) pp 37-42 (Mar) ; *Gemmologist* 1959 Vol 28 (333) pp 70-73 (Apr)

A historical survey of the Amsterdam diamond industry. 2 illustr. *W* *F.25.324*

Mr Oppenheimer says use more diamonds

R. Avery. *News Chronicle* 1959 (5183) p 2 (Apr 20)

A short interview with Philip Oppenheimer. Three-quarters of the illicit operations in Sierra Leone have been suppressed ; Russian production of diamonds will probably be consumed in domestic industries ; GEC synthetics do not constitute a threat. 1 illustr.

W *F.251*

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Abrasive materials : Italy

Anon. *Min Trade Notes* 1959 Vol 48 (4) pp 37-38 (Apr)

A short survey of the Italian bonded and coated abrasives industry during 1957, showing productive capacity, production, imports, exports, and apparent consumption. 1 table. *W* *Rd.25.3225*

Production of bonded abrasives, West Germany, 1957 and the first 3 months of 1957 and 1958, metric tons

Anon. *Min Trade Notes* 1959 Vol 48 (4) pp 30-36 (Apr)

Production of bonded abrasives in W Germany is shown in tables which give figures for the whole of 1957, the first quarter of 1957, and the first quarter of 1958. A 25% production increase is expected on completion of a Duesseldorf subsidiary of the Carborundum Co. A list gives names and addresses of principal abrasives manufacturers. 4 tables.
W *Rd.25.332*

Abrasive materials : Brazil

Anon. *Min Trade Notes* 1959 Vol 48 (4) pp 26-29 (Apr)

Details of Brazil's abrasives industry cover the production of raw materials, production of abrasive products, imports and exports, domestic consumption, and principal producing areas. The diamond grinding wheel industry was established about four years ago; the volume of diamonds used is not known. All but one of the firms specializing in diamond grinding wheels and diamond tools are in the State of Sao Paulo. 3 tables.
W *Nv.25.346/Rd.25.346*

Activities on Russia's diamond fields

Anon. *Diamond News* etc 1959 Vol 22 (6) p 11 (Mar)

Two photographs show (*i*) the kimberlite pipes in Yakutia, and (*ii*) a pile of recovered diamonds. 2 illustr.
W *Ebc.332/Fc.332*

Measures to combat illicit diamond traffic

Anon. *Diamond News* etc 1959 Vol 22 (6) pp 9-10 (Mar)

Extracts from the 1957 Annual Report of the Sierra Leone Mines Department.
W *F.232.3672*

First Russian diamonds

Anon. *Ural* 1958 (11) p 206 (Nov); *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (12) p 3925 (Mar) (Original in Russian)
W *F.33*

News of science and technical methods in other countries. Nouvelles de la science et de la technique à l'étranger

Anon. *Prospection & Protection du Sous-Sol* 1958 (11) pp 53-56 (Nov) (In French, original in Russian)

The methods employed for exploring kimberlite pipes outside Russia can be divided into four types: (*i*) the direct method, *ie* that of examining samples of the actual minerals found by drilling; (*ii*) the indirect method, *ie* that of studying the general geology of the region, especially the techtonics; (*iii*) geophysical methods; and (*iv*) radioactive methods. The use of these methods is described and the findings are briefly discussed, with particular examples taken from diamond fields in S Africa. 9 ref.
A *Cb Ebb*

Mining in Australia

H. H. Batchelor. *Gemmologist* 1959 Vol 28 (333) pp 66-68 (Apr)

A discussion of the occurrence of opal, sapphire, and diamond.
W *Bbd Cb.38/Bbp Cb.38/F:Cb.38*

Abrasive materials : Australia

Anon. *Min Trade Notes* 1959 Vol 48 (4) pp 23-26 (Apr)

Details are given of the Australian abrasives industry, including the names of the principal suppliers and manufacturers. Two tables show (*i*) imports of abrasive materials into Australia, 1957, and (*ii*) exports of natural abrasives from Australia, 1957. Imports of industrial diamonds amounted to 192,295 ct (£420,539), and exports of industrial diamonds were 69,666 ct of domestic production (£143,442) plus 67,959 ct (£141,394) of re-exported stones. 3 tables.
W *Rd.25.38*

Synthetic diamonds in the USA

Gen Electr Co. *SA Min & Engg Journ* 1959 Vol 70 Pt 1 (3448) p 541 (Mar 13)

GEC hopes that synthetic diamonds will be able to meet $20,000,000-worth of US requirements for industrial diamonds. Mr H. Oppenheimer has previously stated that there is probably room on the market for both natural and synthetic products.
W *Fc.251*Fh.251/Fh.13*

Glittering oasis

J. E. Jessop jun. *Gems & Gemology* 1958-59 Vol 9 (8) pp 232-239 (Winter)

Description of a visit to Oranjemund, headquarters of Consolidated Diamond Mines of South Africa Limited. Details of production and recovery methods are given. 8 illustr. *W* *Eb Hd.362*

Results of diamond mining in the Jakutsk area. Die bisherigen Ergebnisse der Diamantschuerfung im Gebiet Jakutsk

K. Schlossmacher. *Zeits d dtsch Gesell f Edelsteinkunde* 1958 (24) pp 12-15; abstr *Journ of Gemmology* 1959 Vol 7 (2) p 68 (Apr) (Original in German)

The article is based on information issued by the German authorities for Foreign Trade who abstracted the Russian publication *Woprossy Ekonomiki*. Six diamond bearing districts were listed: (*i*) Malo-Botuobinsk on the Malo-Botuobujy river, a tributary of the Wiljuij (itself a tributary of the Lena river); (*ii*) Daldyno-Alakitsk (not on the map published by USSR in 1955); (*iii*) Sredne-Marchinsk on the river Marcha, a tributary of the Lena river; (*iv*) Tjungsk on the river Tjung a tributary of the Wiljuij; (*v*) Munsk, on the river Muna, a tributary of the Lena river; (*vi*) Severo-Oleneksk on the river Olenek. Prospecting seems to be advanced in the districts listed under (*i*) and (*ii*). The mines are named Mir in district (*i*) and Udatschnaja in district (*ii*). The two mines are likened to Premier and Jagersfontein. According to *Woprossy Ekonomiki* the production possibilities seem most promising in these districts. *W* *Eb.12.332*

Soviet diamonds. Die sowjetischen Diamanten

Steinert. *Zeits d dtsch Gesell f Edelsteinkunde* 1958 (24) pp 16-17; abstr *Journ of Gemmology* 1959 Vol 7 (2) p 68 (Apr) (Original in German)

Attention is drawn to a Moscow scientific publication of 158 pages by 14 authors on the diamonds of Siberia, and a popular propaganda sheet printed in Germany and published there by the Russian Embassy. Reference to fluorescence of diamonds under x-rays (as opposed to ultra-violet light) in the latter publication seems spurious to Steinert. *W* *F.33*

LITERATURE REQUESTS

When applying for the loan of literature abstracted in this journal, please quote the title of the article, the name of the author, and the number of the page on which it appeared.

. . . man-made diamonds

J. Elovich (Gen Electr Co, Detroit, Mich). *Tool Eng* 1959 Vol 42 (4) p 209 (Apr)

Letter to the Editor.

Referring to an article by C. L. Fanning on synthetic diamonds, [*Ind Diamond Abstr* 1959 Vol 16 p A60 (Apr)] it is pointed out that the price of synthetics is now within 6% of the price of natural diamonds.

W *Fh.252*

PHYSICAL, CHEMICAL, & MECHANICAL PROPERTIES OF DIAMOND AND OTHER HARD MATERIALS

Diamond conduction counters with small electrode separations

F. C. Champion, S. B. Wright. *Proc Phys Soc* 1959 Vol 73 (3) No 471 pp 385-392 (Mar 1)

The variation of the counting properties of diamonds at different electrode separations has been studied in an attempt to explain the magnitude of the charge pulse produced by ionizing radiations such as α-particles; the gap widths were varied from 10 micron up to 1 mm. The best counting diamonds were used, and they were selected to have counting properties as uniform as possible across the surface, allowance being made for very slight variations. A polonium source provided α-particles of homogeneous energy 5.3 MeV, but the introduction of aluminium absorbing foils also allowed lower energies to be used. The apparatus involved the use of Perspex insulators and electrodes on kinematically mounted trolleys, one on either side of the diamond which was also mounted on a Perspex insulator.

The variation of the characteristics of the (pulse height, field) curve with electrode separation, could not be explained for these crystals simply in terms of trapping distribution or field distortion due to dark current. There is evidence that recombination of charge carriers at recombination centres close to the site of ionization is the dominating feature, and dislocations are probably the defects responsible. 3 illustr, 9 ref.

A *Fp Wm*

Falsified diamonds

Anon. *Gemmologist* 1959 Vol 28 (333) p 69 (Apr)

A report at the beginning of this century described a method of improving the colour of yellow Cape diamonds with a solution of alcohol, aniline-violet, and benzoin gum. Nitric acid restores the stone to its true colour. The use of an aluminium pencil in distinguishing diamonds from imitation stones is described.

W *Gbg Tkb.2598*

Texture of sintered corundum ceramics

M. Bartuska. *Silikaty* 1958 Vol 2 (2) pp 139-146; abstr *Glas Technol Journ* 1959 p 58A (Apr) (Original in Czech [?])

W *Bbc Cql Ubb*

Highlights at the Gem Trade Lab in Los Angeles

L. B. Benson jun. *Gems & Gemology* 1958-59 Vol 9 (8) pp 230-231, 254 (Winter)

Examination of 24 yellow diamonds in bracelets showed an absorption spectrum typical of irradiated diamonds. A yellowish-green 8 ct mounted diamond emitted sufficient radiation to be dangerous.

W *F Gbh Ukjc*

Friction, wear and deformation of solids

Based on a paper by F. P. Bowden (Cambridge Univ). *SAE Journ* 1959 Vol 67 (3) pp 78-80 (Mar)

The friction of wood, diamond, and other solids at high speeds is examined. Experiments were performed to find out the effect of liquid impact at high speeds which included the phenomena of scabbing on the back surface.

With regard to diamond, studies were made to see whether the abrasion of diamond by diamond is primarily mechanical or thermal, *ie* whether it occurs by fragmentation of the crystal on a microscopic scale, or by some change due to the local high temperatures produced by friction. These studies cover track formation on diamond and the friction of diamond. According to the conditions of sliding, tracks of three main types can be produced, but there is no variation of the ease of track formation on an individual face with sliding direction. This contrasts with the large directional variation in the ease of abrasion, and indicates that high sliding speeds introduce some effect which causes the anisotropy in abrasion resistance.

During high speed sliding, temperatures up to 1,000 deg C or more may be reached, and may cause a change of the diamond into amorphous carbon, thus being responsible for the wear.

There is a variation with sliding direction of the coefficient of friction between diamond and diamond. Directions in which the friction can be high are directions of easy abrasion, because the local surface temperatures rise with the amount of friction. A small anisotropy in friction would result in a large anisotropy in abrasion resistance. Even the hardest face of diamond can be abraded by metal if the speed is sufficiently high, and this is probably due to the transformation of diamond to carbon already mentioned.

Diamond sliding on glass can, under suitable conditions, induce surface flow of the glass. The influence of speed on flow is studied. Flow seems to occur when a critical surface temperature is reached. Thermal softening and flow of this kind may occur on a submicroscopic scale when glass is polished. The wear of a diamond sliding on glass is up to 100 times greater in a dry atmosphere than in a damp one, and is greater in dry air than on a scaife. This again may be due to the degradation of diamond to amorphous carbon. The degradation is encouraged by the temperature rise at the point of contact, and there is evidence that it can occur at temperatures lower than those required when the diamond is heated without rubbing.

A *B Ung/F Ung/F Unr*

Why x-rayed diamond tools ?

V. Palen (Philips Electronics Inc, Mt Vernon, NY). *Tooling & Prodn* 1959 Vol 25 (1) pp 56, 58 (Apr)

The object of orienting diamonds is briefly explained, and applications of the orientation process are described. A slab sawn off an oriented diamond has a far greater efficiency than a natural flat stone which, when set in a narrow tool, presents its softest face to the work. X-rays of a natural slab and a sawn slab are shown: in the α axis the sawn slab is only 2° off perfect orientation, whereas the natural slab is 37° off the α axis. In the β axis the sawn slab was 1° off whereas the natural slab was 2° off, and in the φ axis the sawn slab was perfect whereas the natural slab was 3° off. The sawn slab outperformed the other by a factor of 2½; this factor can be as high as 10 in some applications.

The greatest benefit of orientation is the consistency of similarly oriented diamonds, thus introducing predictability of tool performance. 4 illustr.

W *F Ubc:N Uqe*

The Williamson diamond mine. I-II

G. J. du Toit. *Mine & Quarry Engg* 1959 Vol 25 (3) pp 98-103 (Mar); (4) pp 147-152 (Apr)

The history of the mine is recounted and the amenities and services provided are described, as well as security measures.

In the second article the geology of the deposit is discussed and details are given of the mining methods. The kimberlite pipes do not always contain diamond, while in others the eruption was so complete as to bring most of the diamond-bearing gravel to the surface and leave the greater part of the pipe almost barren. At the outbreak of World War II, 44 kimberlite pipes had been discovered in Tanganyika, none of which contained enough diamond to make mining worthwhile. The Williamson Mine itself at Mwadui differs from those of South Africa in that very little erosion has taken place, and the mining is complicated by the existence of the original volcanic crater which was backfilled mainly with uneven beds of shales and kimberlites. A number of other minerals accompany the diamond found here. (To be concl). 18 illustr.

A *Eb Hd.364:Vwc|Eb Hd.364:.28*

Natural or synthetic diamond ? Diamant naturel ou synthétique ?

E. Guebelin. *Diamant* 1959 Vol 2 (10/11) pp 14-19, 22-23 (Mar-Apr) (In French and Flemish, abstr in English)

The importance of industrial diamonds, as opposed to gems, is stressed, and the nature of synthetic diamonds produced by GEC is described. These stones are very small and at present suitable only for abrasive uses. Great progress is still to be made in the manufacture of diamond from graphite if large stones are to be produced, and these will probably never be identical to natural diamond. A new product, Borazon, has been manufactured, and is claimed to be harder than diamond. If production of such artificial materials proves satisfactory the manufacture of diamond will be discontinued. 9 illustr, 5 tables.

A *Fh Ha*

' Biography ' of a diamond

Anon. *Zmina* 1958 (11) p 11 (Nov); *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (12) p 3754 (Mar) (Original in Russian)

W *F.21*

New colours are permanent

Anon. *Diamond News* etc 1959 Vol 22 (6) p 15 (Mar)

The *Butte*, Mont, *Post* reports that irradiated diamonds retain their new colours at normal temperatures. Diamonds irradiated with neutrons turn bottle-green; beta rays turn them blue; and gamma rays turn them blue-green. Heat treatment turns irradiated diamonds to amber or golden yellow.

W *Fc Hx*

Cobalt

Anon. *Met Treatment* etc 1959 Vol 26 (163) pp 161-164 (Apr)

The properties and uses of cobalt are outlined, and the alloys for tools and wear parts are discussed.

W *Bfu U|Bfxz U*

The fabrication of titanium

D. Birchon. *Machinery Lloyd* 1959 Vol 31 (8A) pp 53-54 (Apr 18) (In English and German)

The properties of titanium are briefly discussed. HSS and carbide-tipped tools can be used for turning, aluminium oxide and silicon carbide wheels for grinding. 2 illustr.

W *Bfn Ceqb Pd|Bfn Chc Pe*

Dislocations in the diamond lattice

J. Hornstra. *Journ Phys Chem Solids* 1958 Vol 5 (1/2) pp 129-141

It appears that a third type of dislocation beyond those normally discussed in papers on diamond is found in small-angle grain boundaries, namely an edge dislocation in a ⟨100⟩ direction. For this reason the different possible structures of dislocations in the diamond lattice are discussed. Special attention is paid to the occurrence of broken bonds in the core of the dislocations and in jogs; for instance, edge-type dislocations can occur in configurations without broken bonds. Jogs can act as a source or sink of interstitials and vacancies; in the diamond lattice this is complicated by the existence of two kinds of atom sites.

Screw dislocations may form double bonds, 60° dislocations may very easily form extended dislocations, and other types may lose atoms with two broken bonds. Screw dislocations will not readily form extended dislocations, as this involves the formation of broken bonds.

Of the partial dislocations only three types are important, the others being kinetically or energetically unfavourable. Whether partial dislocations do exist is difficult to prove experimentally; it is probable, however, as the surface energy of stacking faults must be low. 19 illustr, 16 ref, 1 table.

A *F Ubb*

Sintering of quartz crystal

A. C. D. Chaklader, A. L. Roberts. *Nature* (London) 1959 Vol 183 (4670) pp 1252-1253 (May 2)

Experiments have determined that the transformation of quartz into cristobalite at temperatures above 1,470 deg C is an indirect process of two consecutive reactions in which a non-crystalline disordered silica phase appears as an unstable intermediary between the quartz and the cristobalite. 2 illustr.

W *Cql:Beb*

Irradiating diamonds

Brookhaven Nat Lab. *Diamond News* etc 1959 Vol 22 (6) p 15 (Mar)

The *Newark*, NJ, *News* reports that 60 yellow or brown diamonds have had their colour improved by irradiation in the past few months.

W *Fc Gbh Hx*

Highlights at the Gem Trade Lab in New York

G. R. Crowningshield. *Gems & Gemology* 1958-59 Vol 9 (8) pp 227-229, 254 (Winter)

An unusual diamond encountered was a greenish-brown stone containing black needles oriented in three directions. A brownish-yellow diamond examined for evidence of irradiation colouring exhibited a hitherto unnoted strong absorption line at 5370 AU; the stone also had the pair of lines at 5040 AU and 4980 AU. The stone fluoresced a subdued ' sulphur ' yellow under 3600 AU. *W* *F Hx Ukp*

The origin of healing fissures in gemstones

W. F. Eppler. *Journ of Gemmology* 1959 Vol 7 (2) pp 40-66 (Apr)

45 illustr, 5 ref. *W* *Bb Uz*

Electrical, optical and elastic properties of crystals of the type of diamond. III. Dispersion and absorption of light

V. S. Mashkevich. *Zh eksper teor Fiz* 1959 Vol 36 p 108; *Insdoc List* 1959 Vol 6 (6) col 407 (Mar 16) (Original in Russian)

W *Bdf Ukh|Bdf Ukj*

The thermoelectric power of a semi-conducting diamond
H. J. Goldsmid, C. C. Jenns, D. A. Wright. *Proc Phys Soc* 1959 Vol 73 (3) No 471 pp 393-398 (Mar 1)

The thermoelectric power of a p-type semi-conducting diamond has been measured in the temperature range 220 to 700 deg K. After subtracting an electronic component, estimated from the previous Hall effect measurements on the sample, it has been possible to determine the phonon-drag component of the thermoelectric power. This component has been found to vary with temperature approximately as $T^{-3.6}$, with a value of about 2.5 mv deg^{-1} at room temperature. The magnitude of the effect is of the order to be expected from the known behaviour of germanium and silicon. 3 illustr, 15 ref. *A* *Fn Uez*

Industry slow to use diamonds, states GE's Kennedy
J. D. Kennedy. *Carbide Engg* 1959 Vol 11 (3) p 42 (Mar)

Improvement values from 35 to 100% over natural diamonds have been obtained from synthetics in certain applications. In metal bonds, except in electrolytic grinding, synthetics showed no superiority. Cut-off operations involving high pressures impose too high a strain on the inherently weaker synthetics. Results in glass grinding varied. *W* *Chc Nvz*

Long range outlook for man-made diamonds
C. A. Nisula (Simonds Abrasive Co). *Machine & Tool Blue Book* 1959 Vol 54 (4) pp 118-120, 122-126 (Apr)

See *Ind Diamond Abstr* 1959 Vol 16 p A59 (Apr). 6 illustr, 2 tables. *W* *Fc Nv*Fh Nv*

USP 2,852,890 (Aug 12, 1955) **W. Drost, R. W. Kebler, Union Carbide Corp**

Synthetic unicrystalline bodies and methods for making same

Sapphire is particularly suited for certain optical work, and its capacity for infra-red transmission makes it highly desirable in infra-red systems. Thin disks of sapphire can be fabricated into polished plates as windows for high temperature furnaces. Larger diameter synthetic unicrystalline bodies cannot be made by the usual (Verneuil) process from boules grown by fusing material on a receding support under an oxy-hydrogen flame, as disks cut from such boules do not exceed ½ in. diameter. The material is therefore fused and accumulated on a rod which has compatible lattice parameters and the same crystal structure, and which is arranged transversely in relation to the flame. The rod is rotated fast enough to bring each point of the outer edge of the growing crystal back under the flame while still molten. The resulting boule is approximately circular in cross section, and its configuration may be varied by holding the seed rod axially stationary or by imparting a certain reciprocation to it. A 2½ in. diameter sapphire disk may be grown at a rate of 150 to 200 ct/hour in about 2½ hours. (10 claims, 7 illustr). Ref cited : 3 USP ; 1 Belg P ; 1 BP ; see also : USP 2,634,554 (burner).
J *Bbd Ceq Wc*

Synthetic sapphire as sensing element in infra-red detectors
Anon. *Instr Pract* 1959 Vol 13 (4) p 410 (Apr)

1 illustr. *W* *W.523*

Measuring and control on machine tools. Messen und Steurn von Werkzeugmaschinen
K. Haeuser. *Industriekurier* 1959 Vol 12 (73) pp 237-238 (May 13) (In German)

The means of measuring and control on grinding machines and drilling and non chip-producing machines are described. The testing styli are usually of diamond or sintered carbide when used on grinding machines. 9 illustr.
A *Cfd Pr.1341/Chc Pr:Cw Nd.1341/Chc Pr:Cw Pdc.1341*

Carbide insert marking tool designed for layouts
Maynor Tool & Cutter Co, 227 Naugatuck Ave, Milford, Conn. *Carbide Engg* 1959 Vol 11 (3) p 32 (Mar)

A new carbide insert marking tool is available for scoring and scribing purposes. The insert tip is diamond ground to the correct angle ; it can easily be resharpened. 1 illustr. *W* *Cz Pdcb*

USP 2,854,794 (Sep 22, 1955) **R. T. Luedeman, Daystrom Inc**

Treating sapphire objects of irregular shapes

Flame polishing has been used at uncontrolled temperatures of 3,100 to 3,650 deg F for simple objects. Instrument jewel bearings, however, may be damaged by such treatment (ripples, distortion) and thus cannot be subjected to the heat of flame-fired, boule-annealing furnaces because of poor temperature control and the possibility of contamination by particles of the lining. It is proposed to fire-polish sapphire objects in a vacuum, either by induction methods using a metallic radiating parts-container, or by resistance elements. This permits construction without refractories and without the use of high velocity gas streams. A v-jewel for use in electrical instruments as shown in 11 in its mount in Fig 1 is first polished by abrasives, then placed with other jewels in crucible 13 of Fig 2 inside a hard glass or 'Vycor' bell jar 14 evacuated through tube 19. Coil 21 then induces currents in crucible 13, raising the temperature to 3,620 deg F for 20 minutes. (3 claims, 4 illustr). Ref cited : 15 USP ; 1 BP. *J* *Bbd Chm Rd Tc/Bbd Chmk Tc*

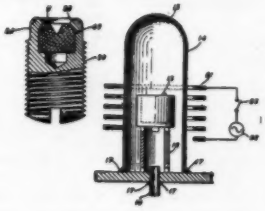


Fig 1 (left) and 2. The v-jewel in its mount and the fire-polishing crucible. USP 2,854,794.

DIAMOND, ETC, IN INSTRUMENTS

Jewel bearings
Anon. *Min Trade Notes* 1959 Vol 48 (4) pp 40-41 (Apr)

Details are given concerning the jewel bearings industries of France and Italy, including the names of principal producers. 2 tables.
W *Tc.13.3215/Tc.13.3225*

HARDNESS AND WEAR TESTING

Measuring machine tool wear
E. I. Goodman. *Atomic World* 1959 pp 28-30 (Jan) ; abstr *PERA Bull* 1959 Vol 12 (3) p 80 (Mar)

The various methods of using radio-activity as a means of measuring the wear of carbide cutting tools are described. *W* *Cw Pdc Unr:Syb*

Hardness of synthetic and natural micas

F. D. Bloss, E. Shekarchi, H. R. Shell (Bureau of Mines, US Dept of the Interior, Norris, Tenn). *Am Mineralogist* 1959 Vol 44 (1/2) pp 33-48 (Jan-Feb)

The hardness of synthetic fluorphlogopite and of two natural muscovites, as measured on (001) by the Knoop indentation method, is definitely anisotropic. In both types of mica, maximum hardness is observed when the long axis of the indentation parallels the *b*-axis, minimum hardness when it parallels the *a*-axis. The pattern of the anisotropy shows, within the limits of measurement, a bilateral symmetry with respect to the (010) plane. Additional minima also occur on either side of the *a*-axis at an angle of 60° thereto for muscovite, but at 75° thereto for fluorphlogopite. Additional maxima for hardness were observed at about 45° to the *b*-axis, not at 60° as had been expected. The anisotropy is interpreted in terms of the ionic structure of the micas involved.

Knoop hardnesses were measured parallel to the *a*- and *b*-axes for synthetic fluorphlogopites in which the following substitutions had been effected: (*i*) ferric and boron ions respectively into the tetrahedral aluminium positions; (*ii*) manganese and cobalt respectively into the octahedral magnesium positions; and (*iii*) barium and strontium into the potassium positions. The boron mica was slightly softer, and the barium mica was much harder than the normal fluorphlogopite. The Knoop hardnesses of natural phlogopite, muscovite, margarite, and biotite were compared with those of the synthetics. The lesser hardness of these natural micas (excluding margarite) in comparison with the synthetic fluormicas is postulated to result, at least in part, from the greater polarizability of (OH) ion than of F ion.

X *Bcbz Unh*

A study of the influence of different factors on Rockwell C tests

K. F. Lindstrand. *Jernkontorets Ann* 1959 Vol 143 (1) pp 29-36 (In Swedish, summary in English)

No international agreement on the Rockwell standard has yet been reached. Jernkontoret's standard hardness blocks have become an unofficial but generally accepted Swedish standard. In connexion with measurements on Jernkontoret's standard hardness blocks in normative machines, it was noticeable in several cases that the Swedish Rockwell C scale showed striking irregularities in relation to the values of the normative machines at different hardnesses. It was therefore considered of interest to determine the uncorrected hardness numbers obtained on testing standard hardness blocks with a number of commercial Rockwell machines, and to compare these values with the values according to Jernkontoret's standard.

Experiments performed on specimen hardness blocks by six firms and institutes, using three penetrators for each test, showed no significant effect of the position of the individual impression on the block. The specific influences of the testing machines, of the diamond penetrators, and of the test blocks, were found to be highly significant. A graph shows the differences in deviation from the correct hardness value which remain if the dissimilarities in machines and diamonds are regarded as being eliminated, and must be taken as an expression of a peculiarity of the Swedish scale. 2 illustr, 1 table. *A* *Unhcd.255.329*

Wear of cutting tools in machining cylinder sleeves

E. V. Ryzhov. *Trakt i sel'khozmash* 1958 (12) pp 34-35; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (12) p 3828 (Mar) (Original in Russian)

W *Az Ceq Pd Unr*

The deformation of metals by Vickers-type pyramidal indenters

T. O. Mulhearn. *Journ Mech Phys Solids* 1959 Vol 7 (2) pp 85-96 (Mar)

It has been confirmed that the mechanism of indentation proposed by Hill et al (1947) for the indentation of a plane surface by a wedge, operates when the wedge semi-angle is less than about 30°. If the wedge angle is greater than 30° a different mechanism appears and becomes progressively more important with increasing wedge angle. This mechanism approximates to a radial compression centred close to the line of first contact of the wedge.

Indentation by conical and pyramidal diamond indenters having an apex semi-angle of 68° also approximates to a radial compression which produces hemispherical surfaces of constant strain centred close to the first point of contact between the indenter and the specimen. With blunt indenters, variations in the indenter shape cause very little difference in the deformation mechanism, except, perhaps, in a highly deformed region close to the indenter. 14 illustr, 10 ref.

A *Bf Cvd Unk*

Wear resistant boron carbide sand blasting nozzles

Anon. *Giesserei-Praxis* 1958 (18) pp 370-371 (Sep 25); *BSCRA Abstr* 1959 Vol 8 (2) p 17 (Mar) (Original in German)

The advantages of boron carbide-lined sand-blasting nozzles are discussed. They include a greatly increased working life for the nozzles, which more than compensates for their greater cost. Such nozzles can be used not only with sand or metal blasting agents but also with corundum and silicon carbide.

X *Pz Rgb Unr Uqe*

The influence of changes in steel structure on tool wear when machining with sintered carbide tools.
Einfluss des Umwandlungsverhaltens von Staehlen auf den Werkzeugverschleiss bei deren Zerspanung mit Meisseln aus Hartmetallegierungen

H. Opitz, G. Ostermann. *Stahl & Eisen* 1959 Vol 79 (8) pp 514-522 (Apr 16) (In German)

30 illustr, 7 ref, 1 table.

A *Bfd Ceq Pdcb Unr*

Hardness tester checks up to 2500 parts per hour

Radio Corp of Am, Industrial & Automation Div, 12605 Arnold Ave, Detroit 39, Mich. *Am Machinist* 1959 Vol 103 (8) p 159 (Apr 20)

2,500 parts/hr can be tested on a hardness tester provided with an electronic gauging system. A conveyor system feeds the parts singly to the indenter, and the depth of penetration causes voltage changes in a gauge head which are taken off and converted to a smoothly varying direct current directly proportional to the degree of hardness. The DC voltage also actuates segregating gates for classifying the parts. 1 illustr.

W *Vghc*

Hardness of electrodeposited speculum metal and other tin copper alloys

V. R. Ramanathan. *Trans Inst Met Finishing* 1958-59 Vol 26 (2) pp 48-50 (Winter); abstr *BNF Bull* 1959 Vol 39 (358) p 203 (May)

Electrodeposits from Cu-CN-Na stannate bath, 65-70 deg C, cathode cd 30A/sq foot. Tests of 136° pyramid hardness on deposited Cu-Sn alloys with 10-86% Sn. Speculum (42% Sn) is hardest, DPH 520±9. If depth of penetration of diamond pyramid is less than $\frac{1}{7}$ of coating thickness, measured hardness is characteristic of coating and uninfluenced by base metal.

X *Bfxq Unh*

Wear of lubricated surfaces

N. Chironis. *Product Engg* 1959 Vol 30 (15) pp 74-75 (Apr 13)

Summaries of papers to the ASME lubrication symposium, Mar 16-17, at Philadelphia. The papers deal with tracing spur-gear wear using isotopes, a new equation for the four-ball testing method, a ski-shaped profile for gear teeth, and the effects of additives in engine lubricating oils. 5 illustr.

W *Cw Pz Unr/Cw Pz Unr:Sy*

Directional hardness of strontium titanate by peripheral grinding

A. A. Giardini, M. A. Conrad. *Am Ceram Soc Journ & Abstr* 1959 Vol 42 (4) pp 165-168 (Apr)

A study was made of the directional variation of grinding hardness in strontium titanate. The method used was that of peripheral (zonal) grinding on oriented thin single-crystal disks. The disks were obtained by diamond sawing a slice from a boule, and diamond core drilling specimen disks from the slice. The abrasive used was a flexible, bonded silicon carbide cloth. A significant anisotropy, consistent with the *m3m* symmetry of the crystal structure, was observed. Experimental data are presented in detail for the three principal zones, *ie* [100], [110], and [111]. 4 illustr, 3 tables.

W *Bfsez Chc Unh/Bfa Cej Ngd*

The wear of abrasives in grinding

G. J. Goepfert, J. L. Williams (Cincinnati Milling Machine Co, Cincinnati, Ohio). *Mech Engg* 1959 Vol 81 (4) pp 69-73 (Apr)

A report on investigations concerning the chemical reactions between metal and abrasive, their effect on abrasive wear, and their modification by grinding fluids. The first approach established the extent to which titanium would react with the abrasive, *eg* aluminium oxide, under conditions related to the grinding process. These conditions were simulated by a Leitz high temperature microscope furnace. Investigations were then carried out on single-point tools and other abrasive work systems. Relationships were established between (*i*) abrasive shape and toughness, and (*ii*) abrasive size and toughness. The degree of chemical reactivity between abrasive and work material was found to be directly related to the surface finish obtained in the grinding process. 15 illustr, 7 ref.

W *Chc Rd Unr*

Tables for reciprocal conversion of hardness numbers

N. P. Slavina. *Izm tekh* 1958 (6) pp 27-29; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (12) p 3791 (Mar) (Original in Russian)

W *Cv Unh.513*

USP 2,858,696 (Jan 13, 1956) **R. A. Underwood, General Motors Corp**

Hardness testing apparatus

The tester is combined with a sorting device to classify metal parts according to their hardness as hard, acceptable, and soft. The Rockwell C scale is used with a spherical tipped diamond indenter. The application of the minor load should be held within a tolerance of 0.00004 in., the total variation permissible in the penetration of the indenter must not exceed 0.0004 inch. The displacement is measured electrically, the device providing a null signal voltage response at either limit of the acceptable range of hardness. The signal voltage controls relays to actuate a sorting apparatus for the parts under test. (11 claims, 2 illustr). Ref cited: 6 USP.

J *Cv Nd Pr*

TRUING OF GRINDING WHEELS

Hydraulic cylindrical grinding machine with profile truing apparatus. Hydraulische Rundschleifmaschine mit Profilabrichtvorrichtung

Cincinnati Nederland NV, Schiedamsedijk 20, Vlaardingen, Holland. *Feinwerktechnik* 1959 Vol 63 (4) p 144 (Apr) (In German)

The machine grinds workpieces up to 250 mm in diameter and 600 mm in length. The tolerance guaranteed is 0.0025 mm. The grinding head is stabilized and has a heavy main spindle. The drive consists of a 5 hp electric motor and a V-belt.

The profiling apparatus is a special new feature, enabling the workpiece to be ground to any desired profile with a high degree of accuracy. The truing diamond and profile stylus are mounted on a movable carriage on ball bearings. Profiles to a depth of 19 mm can be copied, with a clearance angle of up to 90° to the horizontal and an inclined angle of up to 30° to the horizontal. The diamond holder and curve stylus must be brought quickly back into place after each stroke. The maximum width of wheel is 4 inches.

A *Chcz Prz:Nj*

Production grinding-system

A. A. Jones & Shipman Ltd, Narborough Rd Sth, Leicester. *Aircraft Prodn* 1959 Vol 21 (3) pp 117-120 (Mar)

A new grinding machine is described in which the functions of machining, wheel truing, and sizing to a high degree of accuracy can be co-ordinated in an automatic production cycle. The wheel truing unit ensures that this operation is done automatically in a uniform manner at predetermined intervals. For normal straight grinding operations, the diamond is contained in a fixture attached to the front face of the tailstock in such a manner that it does not present any obstruction during the grinding operation. The diamond can be traversed between one and four times across the face of the wheel, and an incremental feed of any value between zero and 0.002 in. applied at each reciprocation. When truing is complete, the wheelhead returns automatically to the grinding position so that the workpiece can be loaded. For profile grinding, form truing equipment can be provided, the operation of which is integrated into the automatic sequence. 5 illustr.

A *Chc Pr/Ab Cg Nj Psf*

Factory Equipment Exhibition

Anon. *Machinery* (London) 1959 Vol 94 (2423) pp 923-928 (Apr 22)

One of the exhibits described is the Royal Oak universal relieving attachment for producing radial and face relief, either separately or simultaneously, by grinding on *eg* milling cutters and boring tools. 9 illustr.

W *Al Chc Pr Ps*

Angular wheel dresser

Myford Engg Co Ltd, Neville Works, Beeston, Notts. *Machinery Lloyd* 1959 Vol 31 (8A) p 65 (Apr 18) (In English and German)

Alternative bases permit the mounting of the truer on the MG 12 cylindrical grinder, or almost any other cylindrical grinder, as well as on a horizontal spindle surface grinder. Swivelling through 360° facilitates all positioning requirements, from shallow angles to side relief. 1 illustr.

W *Chc Pr:Pf/Chcm Pr*

New readers are advised to see the List of Publications, cover iii; several of the listed publications are available *gratis*.

Mechanism for automatic straightening of abrasive wheels

I. M. TSiperfin, A. I. Stanishevskii, S. I. Kaminnik. *Mashinostroitel'* 1958 (11) pp 9-10 (Nov); *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (12) p 3790 (Mar) (Original in Russian)

W *Cg Pe Rd:Prs*

USP 2,851,827 (Nov 8, 1957) **J. E. Hill, Norton Co**

Multiple wheel grinding machine

A number of spaced grinding wheels are arranged simultaneously to grind a number of spaced portions on a workpiece. The wheels are simultaneously trued after each grinding operation, or during grinding, by a traversing movement of a number of spaced truing tools automatically fed towards the automatically advanced wheels. Each of the truing tools can be adjusted by minute increments to compensate for wheel wear caused by grinding, or for truing tool wear caused by the truing operation. This compensating movement is automatically initiated in co-operation with size gauges, and is also combined with an unwind and wind motion of the feeding mechanisms for grinding wheels and truing tools at the time of each feeding movement so as to take up backlash. The cycle of operation is electrically controlled and hydraulically actuated, but may also be manually controlled. (10 claims, 8 illustr). Ref cited : 1 USP ; see also USP 2,267,559 ; 762,838 ; 2,720,063 ; 2,522,485. *J* *Chc Pr Psf*

USP 2,853,836 (Dec 6, 1956) **A. Fumia, Gleason Works**

Grinder for truing cutters

The machine is especially intended for grinding gear cutters with angular side cutting profiles. The grinding wheel is arranged on a slide to move the wheel between a truing position and the grinding position. In the truing position a hydraulically operated and electrically controlled profile truing device produces the wheel profiles for cutters of different pressure angles. Fig 3 is a side view, Fig 4 a section of the truing device, Fig 5 a schematic view of wheel and truing tool, Fig 6 and 7 views of the truing tool carrier in two planes. Diamond truing tool *T* is mounted on arm 107 of an L-shaped tool carrier on piston rod 108 supported on ball sleeve bearings 112 for motions relative to housing 104 about axis 113 and also along this axis. The axis 113 intersects the adjustment axis 103 at right angles.

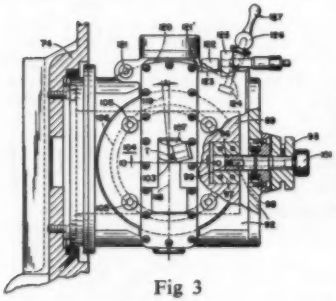


Fig 3

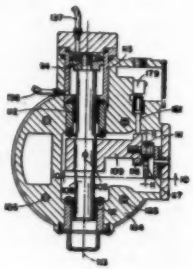


Fig 4

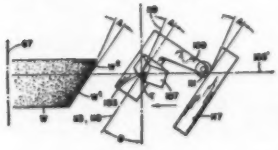


Fig 5

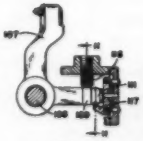


Fig 6

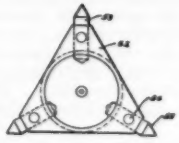
Fig 7

A spring-backed plunger 116 acts on arm 109 to hold roller 111 against cam 117 on housing 104. Tip *T* moves in a straight line 118 until it reaches axis 103, then swings the upwardly-moving carrier about axis 113 to cause the tip *T* to move along diverging line 119 at angle *A* to line 118. First the conical side W^1 is trued, then W^2. (18 claims, 26 illustr). Ref cited : 3 USP. *J* *Alz Chc Pr|Nj Psfb*

USP 2,853,993 (Nov 28, 1956) **H. S. Jakobsen**

Stone dresser

The profile truing device uses three diamonds and a template, one diamond for roughing, the second for medium work, and the third for finishing. The diamonds wear and are therefore checked from time to time on a testing table represented in Fig 8 which shows the triangular arrangement of the diamonds 53 on top of holder 50. Fig 9 shows a diamond to be placed in contact with element 40. If worn, the indicator 31 will register a discrepancy. The device is then readjusted and the tracing elements in the same triangular arrangement at the lower end of holder 50 re-ground by grinding wheel 15 until tracer point and diamond point are in exact alignment. (2 claims, 5 illustr). Ref cited : 4 USP. *J* *Njd*



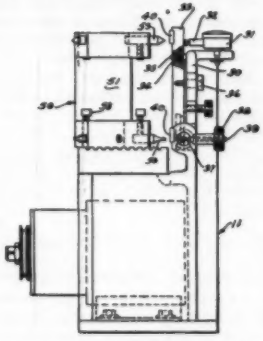


Fig 8 (above) and 9. The diamond holder with three diamonds, and the fixture in use. USP 2,853,993.

USP 2,853,994 (June 10, 1957) **P. P. Ronches, Form-All Mfg Co**

Radius and tangential angle dresser

As shown in Fig 10 and 11, diamond tool 50 is mounted on a swivel base 11. The desired radius is set by shifting carriage 16 in the swivel base 11. Diamond head 25 is keyed to carriage 16 and urged by spring 35 into neutral position. Gear rack 40 engages a pinion 41 rotatable by knurled handle 44 to move diamond head 25 laterally relative to carriage 16. The setting of carriage 16 in swivel base 11 is determined by micrometer pins 20 and 22. In neutral position a 360° radius is cut ; by increasing the difference between the micrometer pins the radius on the wheel will be shortened, and by decreasing the radius will be increased until it becomes concave. (3 claims, 4 illustr). Ref cited : 3 USP ; 1 BP. *J* *Cg Nj Pe*

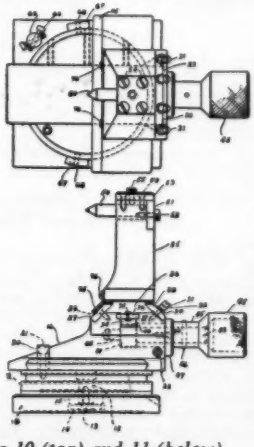


Fig 10 (top) and 11 (below).

USP 2,854,966 (Apr 17, 1956) **W. Ladinsky**
Diamond truing devices for abrasive cutters

Instead of easily blunted diamond points for truing grinding wheels, disks are used having, internally, a thin flat layer of diamonds or of a diamond-containing composition. Fig 12, 13, and 14 represent one embodiment of the idea. A diamond aggregate 1 of parallel layers of diamond grains 2 in steel strips 3 is fixed in a mounting 5, 6, 7 with stem 8 to be clamped in the tool holder of a truing device. Chain lines 10, 10^1, 10^{11}, indicate the progressive wear until the active part of disk 1, 2, 3 is worn away. (2 claims, 9 illustr). Ref cited : 6 USP. *J* *Al Cg Nj*

Fig 12

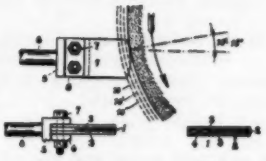


Fig 12 (top), 13 (below, left), and 14 (below, right). The new truing device showing method of applying it to the wheel and sections through the truer. USP 2,854,966.

Fig 13 Fig 14

USP 2,855,729 (Aug 8, 1955) **F. Render, Cincinnati Milling Machine Co**
Grinding machine

The machine is a centreless grinder in which the regulating wheel is trued in a way that provides a gradually decreasing diameter from front to rear. The wheel head carries an angularly adjustable regulating wheel. The truing tool head is manually reciprocable. Adjusting bolts serve for additional control of the truing tool movement by determining the angular setting of a guide bar on the upper face of which rides a pin which automatically controls the axial movement of the truing tool. The decrease of regulating wheel diameter causes a slowing down of the work feed, preventing gaps between the individual workpieces (races). The diamond is offset relative to the axis of the diamond holder, and follows a path determined by the angle set by the adjusting bolts. (1 claim, 6 illustr). Ref cited : 5 USP ; see also USP 1,659,237 ; 1,952,157. *J* *Chcc Pr*

USP 2,855,731 (Dec 26, 1956) **C. Stelmachowski, Super-Cut Inc**
Truing device for peripheral type grinding wheels

The correct mounting of diamond grinding wheels is of particular importance in order to produce exact work contours and to avoid vibrational effects. Only extremely small eccentric tolerances are permissible.

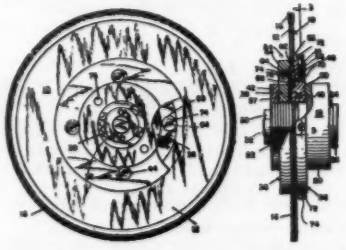


Fig 15 (left) and 16. Peripheral grinding wheel with adjusting elements. USP 2,855,731.

The mounting according to Fig 15 and 16 is characterized by adjusting elements 44, preferably four in number. Rear clamping ring 36 fits against annular shoulder 50 on adapter head 20. Front clamping ring 38 is similar. The adjusting elements 44 consist each of a short cylindric 1 rod with an enlarged circular head eccentrically disposed to the rod axis. Set screws 72 lock the rod in the adjusted position. The eccentric heads are interposed between the inner periphery of the mounting opening 14 of the grinding wheel 10 and the outer cylindrical surface 51 of the annular shoulder 50 of rear clamping ring 36. By turning the adjusting elements 44, diamond matrix 16 may be made to run exactly true with respect to the axis of spindle 26 before clamping it finally between rings 36 and 38. (7 claims, 4 illustr). Ref cited : 4 USP. *J* *Cg Nv*

USP 2,855,917 (Apr 4, 1957) **A. A. Berg**
Dressing attachment for surface grinders

The truing device is intended for truing straight or bevelled edges of a grinding wheel with a single diamond tool. Fig 17 shows the position of diamond 90 when truing face 24a of wheel 24. The tool holder is mounted on a base 50 in a socket (not shown) where

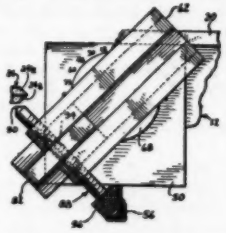


Fig 17. Swivelling diamond truer for surface grinders. USP 2,855,917.

it can be swivelled to the left or right, the angle being indicated on a scale. It is clamped in position by screw 56. Diamond 90 is fed by turning knob 96. 88 is a commercial truing tool shank available in unthreaded condition. Base 50 is placed on a magnetic chuck, diamond 90 set as desired, and holder 82 reciprocated in the dovetail groove, and, for deeper cuts, knob 96 turned for feeding the diamond towards the wheel. The workpiece remains in its position during the truing of the wheel. (6 claims, 8 illustr). Ref cited : 3 USP. *J* *Chcm Pr:Njs*

USP 2,858,652 (Nov 13, 1957) **J. J. Luthman, R. N. Roney, Sheffield Corp**
Machine tool device

The 'loading-up' of grinding wheels reduces their efficiency. It is proposed to restore the grinding surface by a combination of flooding the surface and producing cavitation effects within the liquid by oscillations at high frequencies and minute amplitudes. The intense cavitation effect results in most effective grinding. (8 claims, 5 illustr). *J* *Chc Pr*

USP 2,860,622 (Sep 21, 1956) **G. A. Hider, Gleason Works**
Grinding machine having rotatable wheel dressing tool

The truing diamond is periodically turned by uniform

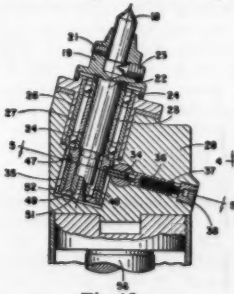


Fig 18

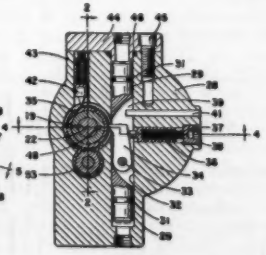


Fig19

increments. A pawl and ratchet device is actuated, and the stepwise rotation transmitted through to the tool so that the tool is advanced through a different angle than the ratchet. This difference is such that the tool repeats its position only after it has made a number of complete revolutions, which results in always presenting an edge of the diamond to the wheel, rather than a flat face. Fig 18 and 19 are sectional views through the truing tool and its supporting head. Diamond-tipped tool 18 in holder 19 is rotatable in ball bearings 24. Step-by-step rotation is effected by piston 29 actuating pawl 34 engaging ratchet wheel 35. The rotation is transmitted through gear mechanism 47, 52, with elongated pinion 53. Gears 47 and 52 have different tooth numbers while both are in mesh with pinion 53. Tool 18, 19 is turned for each complete turn of ratchet wheel 35 through slightly more than one turn, and it takes, with the selected tooth numbers of the example shown, over forty-one complete turns of the ratchet wheel to cause the diamond tool to return to its initial position. (8 claims, 5 illustr). Ref cited : 4 USP ; see also USP 2,224,959. *J* *Chc Pr:Nj Psf*

USP 2,860,623 (May 14, 1953) **W. Muench, Walter Muench Inc**

Long cutting edge diamond tool for dressing grinding wheels

A diamond truing tool which can be quickly centred and which has an elongated cutting edge of any desired length, which does not chip and which is easily reconditioned, is obtained as in Fig 20, 21, and 22, by

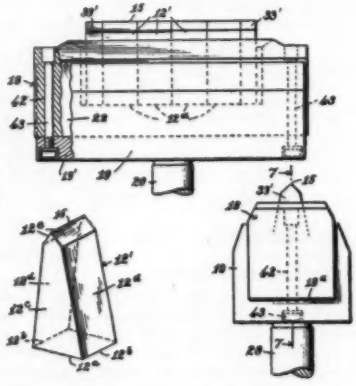


Fig 20 (top), 21 (below, left), and 22 (below, right). Easily centred diamond truing tool with several diamonds. USP 2,860,623.

arranging a number of similar diamonds side by side in a holder with abutting and co-planar faces converging to form a single continuous straight cutting edge. The diamonds may be replaced by a single diamond with a long cutting edge to be applied to the wheel to be trued tangential to its periphery. The diamond 12^1 may be held (fused) in casing 18 having the usual mounting shank 20. Guard pieces 33^1 protect the end faces of the diamonds. (6 claims, 16 illustr). Ref cited : 7 USP ; 1 Swiss P ; 2 BP. *J* *Ab Cg Nj Pr*

FINE BORING AND FINE TURNING

Progress in turning with aluminium oxide cutting disks. Fortschritte beim Drehen mit Aluminiumoxydschneidplatten

W. Dawihl, E. Klingler. *Werkstatt & Betrieb* 1959 Vol 92 (5) pp 271-274 (May) (In German)

11 illustr, 6 ref. *A* *Ceqb Pef Rj*

Economical turning and hobbing with clamped cutting materials. Wirtschaftliches Drehen und Hobeln mit geklemmten Schneidwerkstoffen

Anon. *Maschwelt & Elektrotechnik* 1959 Vol 14 (7/8) pp 171-172 (Apr) (In German)

Various types of clamped tool holders are described, and the advantages of their use are pointed out. 5 illustr. *A* *Ceqb Psp/Cfq Psp*

On the history of chip forming machine tools. Aus dem Werdegang spanabhebender Werkzeugmaschinen

Anon. *Industrie Anzeig* 1959 Vol 81 (30) pp 31-32 (Apr 14) (In German)

3 illustr. *A* *Ceq Pr*

A new tool design and the self-curling of chips

V. Bernavski. *Stanki i Instr* 1958 Vol 29 (2) pp 1-5 (Feb) ; *Machines & Tooling* 1959 Vol 29 pp 33-37 (Specimen issue) (Original in Russian)

W *Ceq Pd Uqb*

Shorten your drills for greater tool life !

H. Conn (Scully-Jones & Co, Chicago, Ill). *Carbide Engg* 1959 Vol 11 (3) pp 26-27, 29-30 (Mar)

6 illustr. *W* *Cfb Pl Uqb*

It's a 10 : 1 bet that . . . most of your machines are loafing

C. R. Demmitt, R. L. Peterson (Kennametal Inc, Latrobe, Pa). *Am Machinist* 1959 Vol 103 (7) pp 117-119 (Apr 6)

Case histories are cited to prove that machining costs can be reduced by stepping up machining speeds and feeds to give a 30 min edge life for throwaway carbides. 3 illustr. *W* *Ceq Uqfb.145*

New ground forms for spiral drills and new drilling Methods. Neue Spiralbohreranschlifformen und Bohrverfahren

H. Drees. *Fertigungstechnik & Betrieb* 1959 Vol 9 (4) pp 207-214 (Apr) (In German)

15 illustr, 8 ref, 2 tables.

A *Chc Pl/Cfb*

Fine boring for engine cylinder blocks

Landis Lund Ltd, Cross Hills, Keighley, Yorks. *Machinery Lloyd* 1959 Vol 31 (9A) pp 50-51 (May 2) (In English, French, and German)

3 illustr. *W* *Az Cfdb Pr*

What demands are made on tools by automation. Was fordert die Automatisierung vom Werkzeug ?

H. Martini. *Fertigungstechnik & Betrieb* 1959 Vol 9 (4) pp 199-206 (Apr) (In German)

15 illustr. *A* *Pd.133*

High speed steel

J. F. McAuliffe (Pratt & Whitney Co Inc, West Hartford, Conn). *Carbide Engg* 1959 Vol 11 (3) pp 11-14 (Mar)

A survey of the position of HSS as a tool material. It is concluded that the material will continue to be the 'backbone' of tool materials in the forseeable future. 3 illustr, 1 table. *W* *Pdb*

Testing cutting tools

A. Sadowski. *Polish Techn Abstr* 1958 (3) p 65 (Original in Polish)

Book, PWT, Warsaw. 1956, 330 pp, illustr.

Deals with testing of materials used for the production of tools, with tool measuring devices, and with methods of testing tools, reamers, milling cutters, and abrading tools. [Not in library of Ind Diamond Inf Bur].

X *Pd.1341*

Titanium carbide bits developed to wear longer; cost less

Ford Motor Co, Dearborn, Mich. *Purchasing Week* 1959 Vol 2 (12) p 1, 22 (Mar 23)

A new form of titanium carbide, bonded with a combination of nickel and molybdenum, has been used in the manufacture of metal cutting bits. Lower costs and longer life are claimed for bits made of the new material. *W* *Al Bkce Urb*

Titanium carbides have longer life

Ford Motor Co, Dearborn, Mich. *Metalworking Prodn* 1959 Vol 103 (16) p 692 (Apr 17)

Tool life data are presented to support claims that titanium carbide tool materials outlast tungsten carbides, ceramics, and other cutting materials. 1 illustr. *W* *Pdc Uqe*

The mechanical fastening of sintered carbide and ceramic cutting inserts. Die mechanische Befesting von Hartmetall- und Keramikschneidplatten

E. Heymel. *Fertigungstechnik & Betrieb* 1959 Vol 9 (4) pp 226-228 (Apr) (In German)

9 illustr. *W* *Pdcb/Pddb*

Sintered shanks damp tool vibration

Johnson, Matthey & Co Ltd. *Metalworking Prodn* 1959 Vol 103 (16) pp 675-676 (Apr 17)

Mallory No-Chat is a tungsten-based powder metallurgy product specially designed to reduce tool chatter. The reduction in chatter is due to its physical properties which are described. 1 illustr, 2 tables. *W* *Psz Rz:Qp*

Interim report on the increased cutting speeds in use today. Zwischenbericht ueber die Vervielfachung heute ueblicher Schnittgeschwindigkeiten

M. Kronenberg. *Werkstattstechnik* 1959 Vol 49 (4) pp 181-184 (Apr) (In German)

6 illustr, 5 ref. *A* *Ceqb Uqfb*

Chip formation in metal cutting

M. M. Lamm. *Engineering* 1959 Vol 187 (4856) pp 444-446 (Apr 3)

A hydrodynamic theory of chip formation is proposed. 12 illustr. *A* *Bf Ceq.21*

Finishing aluminium valve bodies with diamond tools. Bearbeitung von Al-Ventilgehaeusen mit Diamant-Werkzeugen

J. Waller. *Ind Diamond Rev* 1958 Vol 18 (217) pp 235-237 (Dec); abstr *Ind Anzeig* 1959 Vol 81 (36) p 564 (May 5) (Original in English, abstr in German)

See *Ind Diamond Abstr* 1959 Vol 16 p A27 (Feb) *W* *Cff Nr*

Ceramics and their use as cutting materials. Keramik und ihre Anwendung als Schneidwerkstoff

W. Wolf. *Fertigungstechnik & Betrieb* 1959 Vol 9 (4) pp 220-223 (Apr) (In German)

7 illustr. *A* *Pdd*

Indicating devices for accurate measurement of tool slide movement

V. I. Zakusilo. *Machines & Tooling* 1959 Vol 30 (1) pp 30-31 (Jan) (In English, original in Russian)

1 illustr. *W* *Pr Wp*

Methods for deep drilling. Methoden des Tiefbohrens

R. Ziermann. *Fertigungstechnik & Betrieb* 1959 Vol 9 (4) pp 215-219 (Apr) (In German)

15 illustr, 5 ref. *A* *Cfbz*

Specialisation in production of tool holder blanks

G. I. Shandrenko. *Vestnik Mash* 1959 Vol 39 (3) p 78 (In Russian)

W *Az.13*

How to estimate tool life. Fragen der Standzeitbestimmung

H. Siebel. *Industrie Anzeig* 1959 Vol 81 (36) pp 549-554 (May 5) (In German)

Sintered carbide tools are discussed with reference to correct tool geometry and the performance obtained from different combinations of speed, angles, and general design. 17 illustr, 24 ref. *A* *Pdc.21*

Sinter alumina for cutting tools

F. Singer, S. S. Singer. *Refractories Journ* 1958 Vol 34 pp 456-462 (Oct); *Battelle Techn Rev—Abstr* 1959 Vol 8 (3) p 160a (Mar) (No 3229)

W *Pdd Uqb Uqe*

Modernizing capstan lathes

B. L. Smolyensky, M. A. Rokhlyenko. *Machines & Tooling* 1959 Vol 30 (1) pp 16-18 (Jan) (In English, original in Russian)

5 illustr. *W* *Ceq Pr.192*

USP 2,853,903 (Aug 31, 1956) **A. F. Hauser**

Micro-drilling machine

The machine is intended for drilling holes of the order of 0.001 in. diameter. A special feed control mechanism is incorporated which prevents undue pressure on the drill and which feeds the drill through the workpiece at a predetermined rate to the desired depth. An automatic cut-off permits a number of machines to be tended by one operator. Fig 23 is a view of the machine. The

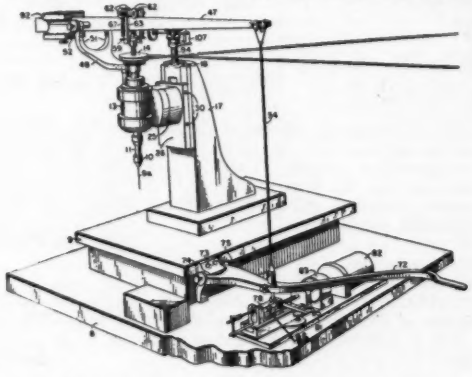


Fig 23. Micro-drilling machine for drilling holes of the order of 0.001 in. diameter. USP 2,853,903.

control motor is 82 turning cam 86 under sine bar slide 78 which causes rod 54 to be lowered, feeding drill 9a into the work. Each revolution of the feed screw advances the slide table approximately 1/32 in., the feed depending on the angle of sine bar slide 78. This feed is continuous during motion of carriage assembly 85, the action of cam 86 causing periodic withdrawal of the drill to facilitate chip discharge. The pumping action produces a whirlpool of the coolant, whirling the small chips in circles away from the drill and preventing abrasion of the drill and the finished work. The dial indicating the adjustment of the drill is calibrated to denote 0.00002 in., the operator using a magnifying glass of 36 power. (3 claims, 7 illustr). Ref cited: 2 USP; 1 FP. *J* *Cfdb Pr*

CUTTING AND MACHINING OF GLASS

Here is how glass-base laminates can be successfully machined

E. C. Graesser. *Canad Machinery* etc 1959 Vol 70 (3) pp 72-73 (Mar)

Sawing is accomplished with a 12 in. diameter, 1/16 in. thick, diamond-impregnated copper wheel, cutting dry at 3,000 to 3,600 rev/minute. A water coolant can be used if required. Band sawing can be done with steel blades, or, more efficiently, with the newly-available diamond coated bandsaw blades. Carbides should be used for tapping, threading, drilling, turning, and similar machining operations. 6 illustr.

W *Bp Cej Nt Sbb/Bp Ceq Pdc/Bp Cfb Pdc*

My suggestions [glass cutting]

B. Krimberg. *Stroitel'* 1958 (11) pp 12-13; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (12) p 3786 (Mar) (Original in Russian)

W *Bm Ceg*

Residual diffusion of polished surfaces and gratings. La diffusion résiduelle des surfaces polies et des réseaux

A. Maréchal. *Opt acta* 1958 Vol 5 (3/4) pp 70-74 (Sep-Dec); abstr *BSIRA Bull* 1959 Vol 14 (3) p 88 (Mar) (Original in French)

A study of the diffusion of light yields useful information about the quality of polish of an optical surface. The present paper gives only a theoretical treatment; experimental results are to be published later.

X *Ukz*

High-speed grinding of optical parts

D. M. Model'. *Med prom* 1958 Vol 12 (11) pp 47-52 (Nov); *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (12) p 3790 (Mar) (Original in Russian)

W *Bm Chcz Tfc*

The Double Diamond

George Rodway Ltd, 56 Hatton Garden, London EC 1. *Mfg Opt* 1959 Vol 12 (6) pp 346-347 (Apr)

Each component process of the lens edger is independently operated by its own motor, and operation is completely automatic. Two diamond wheels are used, one to edge the lens to size and another to bevel the edge. A gauge and a shape former dictate the shape and size to be cut. 2 illustr.

W *Chc Nvd Prs Tfb*

New methods of glass cutting

A. Takh. *Zhil-kom khoz* 1958 Vol 8 (11) pp 22-24; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (12) p 3786 (Mar) (Original in Russian)

W *Bm Ceg*

MACHINING OF STONE, ETC

Diamond core drill

Geo-Drill Co, PO Box 6, Bridgeville, Pa. *Roads & Streets* 1959 Vol 102 (1) pp 121, 124 (Jan)

A portable electric diamond core drill and accessory thin wall diamond bits are being manufactured for drilling close-tolerance holes and test cores in reinforced concrete and asphalt pavement. Holes at any angle can be drilled either for maintenance use or test cores. The drive is a 1½ hp, 110-220 v, 60 cycle, AC electric motor which develops a bit speed of 1,000 rev/minute. 1 illustr.

A *Cfb Nhe Pr*

Manufacture of germanium rectifiers

Hackbridge & Hewittic Electric Co Ltd, Hersham, Walton-on-Thames. *Machinery Lloyd* 1959 Vol 31 (9A) pp 72-73 (May 2)

Crystals are grown by the pulling technique and shaped into square sectioned sticks. Wafers 0.03 in. thick are obtained with a precision diamond saw and lapped to a thickness of 0.02 inch. The wafers are then cleaned, etched, and washed, after which they are incorporated in the diode. 7 illustr.

W *Bd Cej Nt/Bd Chd/Bd Qeb/Bd Ql*

USP 2,855,733 (Dec 28, 1956) **H. V. Allison, American Chain & Cable Co Inc**

Abrasive cutting wheel method

Hard cutting wheels have been used for soft materials and small cross-sections, soft cutting wheels for hard materials and large cross-sections. A soft cutting wheel will not so easily glaze as a hard wheel, and will rapidly release built-up particles of the material cut and worn abrasive particles. It has been found that by oscillating the wheel spindle at the rate of no less than 150 cycles/min, with an amplitude of 1/16 to ¼ in., it becomes possible to cut both hard and soft materials with one hard grade of wheel, at a high rate and a constant low motor load. (2 claims, 3 illustr). Ref cited: 3 USP.

J *Pe.21*

USP 2,857,671 (Nov 13, 1956) **M. E. Nelson**

Dental grinding instrument

Thin grinding wheels do not generate excessive heat but their operation is time consuming. A wheel with thin cutting edges which nevertheless is capable of reducing a tooth or making an opening in a minimum of time is obtained by having a groove around its rim to form thin grinding edges, and on attaching to the dental handpiece a conduit from which a pressurized stream of fluid is directed onto the contact point between wheel and tooth. The wheel shank is integral with the abrasive portion which preferably comprises diamond particles embedded in a metal base. (5 claims, 4 illustr). Ref cited: 1 USP.

J *Nv Pr*

GEM POLISHING

Gem polishing. II. Aus der Praxis des Edelsteinschleifens. II

E. Frey. *Dtsch Goldschmiede Ztg* 1959 Vol 57 (3) pp 124-125 (Mar) (In German)

This part is concerned with the fixing and polishing of the stone. Gluing is only necessary if it is too small to be held comfortably in the fingers. The glue may be of a variety of substances and heat is required for the operation. After polishing, the stone is removed either by a sharp blow with a knife or by first chilling in cold water or ice, and then heating the stone gently until it springs out of the setting.

Polishing is generally performed with a silicon carbide-impregnated wheel, 80 or 100 mesh for rough work and 180 or 220 mesh for fine work. A wheel with a soft bond will polish faster and remove more material, and one with a hard bond polishes more slowly, abrading less. Cooling is important. Diamond grinding wheels are used in industry because they give greater speeds and a smoother finish, but they are too expensive for the amateur. 3 illustr.

A *Bb Cr/Bb Chm*

ROCK DRILLING

The development of a diamond drill bit

L. M. Bayley. *Chem Engg & Min Rev* 1959 Vol 51 (5) pp 46-49 (Feb 16)

At the Warragamba Dam in Australia, diamond drilling with conventional bits proved to be uneconomical, because excessive wear of the matrix resulted in high diamond losses (27 ft/carat) and the average footage obtained from each bit on fast drilling fell to 146 ft from the average 262 ft obtained with slow drilling.

An attempt to overcome the difficulties by replacing the angular outer edge of the bit with a rounded edge, and by introducing a second water hole to provide a greater supply of water to wash away the drilled rock and cool the diamonds, proved unsuccessful. It was found that the original type failed first at the sharp edge and that the wear extended to the water hole, while the modified bit failed because of insufficient diamonds on the water hole radius, resulting in a ring forming in the face and the eventual failure of the outer edge of the bit. The discovery that the angle included in the taper of both types of bits, when worn, was 60°, prompted the decision to re-design the bit to conform to the worn condition.

With a newly designed taper bit, performance improved to the extent that 74 ft of drilling was obtained per carat of diamond, but there was a slight deterioration in the footage/carat of the reamer. It was found that the diamond slugs mounted in the sides of the shell caused a blockage to the flow of water which removed the drillings from the bit, and set up a rock paste between the bit and the reamer. To remedy this, the bit and the reamer were made as a single unit. The final unit adopted after experiments was one with a taper face bit and four slugs of one carat each set in the trailing end of the blank. The general average performance of these bits is 838 ft/bit.

Further development is considered economically impossible until a matrix is introduced which is more resistant to abrasion than those in use, and a readily worked material as hard as stainless steel becomes available for the manufacture of blanks. 7 illustr, 2 tables. *A* *Nh Unr.131*

Active search continues to improve drilling techniques

Anon. *World Petrol* 1958 Vol 29 (9) p 54; abstr *Inst Petrol Journ* 1959 Vol 45 (422) p 20A (Feb)

A recent development is a variant of the turbo-drill known as the wheel drill. It consists of a diamond-faced cutting wheel powered by the turbine, which, in its turn, is operated by the drilling fluid: results of tests have not been published. Other varieties of drills are also discussed, and possible developments and shortcomings are outlined. *A* *Cfbd Nv Sjc*

Re-tipping drill steels

Anon. *Chem Engg & Min Rev* 1959 Vol 51 (4) pp 33-35 (Jan 15)

4 illustr. *A* *Pl Rw*

Boring in shallow water

Anon. *Coll Engg* 1959 Vol 36 (422) pp 140-141 (Apr)

An account is given of drilling from a special platform erected in the Firth of Forth, using a 10 in. diamond coring bit for geological explorations. 2 illustr.
A *Cfd Nhe.321*

Air drilling operations in Kentucky

J. Henning, G. Thomas (United Fuel Gas Co, Charleston, W Va). *World Oil* 1959 Vol 148 (5) pp 177-180 (Apr)

7 illustr. *W* *Cfb Pl Qs Sjh*

Channel tunnel

Anon. *Research* 1959 Vol 12 (5) p 201 (May)

Refers to diamond drilling to a depth of about 600 ft on both sides of the proposed Channel tunnel route. Cores of 4½ in. diameter were recovered.
W *Bn Cfb Nh.321.3215*

Pump shut-off saves diamond bit

H. Baumgurtel Zinc Corp Ltd, Broken Hill, Australia. *Engg & Min Journ* 1959 Vol 160 (4) p 122 (Apr)

When drill rods are blocked, the pump usually continues to function, thus giving the driller the impression that the water is still reaching the diamond bit; the bit can easily be damaged in this way. Neoprene or pliable leather cups can be used for jamming the direct-acting pump as soon as the discharge is shut off. The arrangement of the cups is shown. 1 illustr. *W* *Nhb Qs*

Slim hole operations in Canada

W. D. Freeborn, D. R. Wright. *World Oil* 1959 Vol 148 (5) pp 166-168, 173 (Apr)

A 25-well slim hole drilling programme in Alberta, Canada, showed (*i*) a 37% reduction in completion costs can be obtained through the use of slim hole completion methods; (*ii*) a 20% reduction in total well costs can be obtained by using slim hole drilling and completion practices; and (*iii*) equal penetration rates and daily drilling progress can be achieved with 6¼ in. bits, in the area discussed, as compared with 9 in. bits. 3 illustr, 3 tables. *W* *Cfbz.145*

Experts discuss the future of the turbo-drill

J. M. Jones & coll. *Journ Petroleum Technol* 1959 Vol 11 (3) pp 14-18 (Mar)

Results obtained and wear characteristics of turbo-drills are discussed. The Russians use tandem turbines to maintain power at slower speeds of rotation. The French have turned to turbo-drilling methods after receiving such favourable reports from Russia. In the report on turbo-drill performance in field tests, it is pointed out that diamond bits offer considerable possibilities on the turbo-drill: on one test a diamond bit drilled 434 ft of limestone and shale in a 40-hour run, *ie* 10.8 ft/hr. In abrasive sandstone and limestone a more recent run was made of 7.1 ft/hour. The two basic designs which appear adequate for a wide range of formation characteristics have deep concave centres with ample cooling at the centre of the bit. One has large water courses and narrow diamond pads which spiral from the centre, while the other has small waterways between each row of diamonds. This latter design cuts a small core of ¾ in. diameter which is ejected above the face of the bit. 2 illustr, 2 tables.
A *Cfbd.132.3215/Cfbd.132.33*

Contribution to the theory of rotary drilling

T. Opolski. *Przeglad Gorniczy* 1957 (9) pp 420-425; *Polish Techn Abstr* 1958 (3) pp 11, 13 (Original in Polish)

Resistance to cutting is difficult to determine especially in the case of drilling. Experimental results show that the pressure of drilling results mainly from the friction of cuttings against the attacking face of the bit. The influence on drilling pressure of blunting of the cutting edge and errors in cutter design is here explained, and it is shown that determining the pressure of drilling from the depth of penetration of the cutting edge under static pressures is unreliable. Characteristic relationships between the drilling rate and the pressure on the drill are discussed, and emphasis is laid on the practical significance of a good understanding of theoretical aspects of rock drilling and other methods of working in rock. *X* *Cfb Pl Uqb*

New Hartex grinding machine. Neue Hartex-Schleifmaschinen

Hartex GmbH, Berlin-Marienfelde. *Maschwelt & Elektrotechnik* 1959 Vol 14 (7/8) p 186 (Apr) (In German)

Two new machines are the hydraulic universal cylindrical grinding machine RH 1, and the centreless cylindrical automatic grinder BED 4. The former is for working on internal and external surfaces in one position. A special lubrication system prevents the wheel spindle from running dry and lubricates all bearings. The second machine is particularly suitable for grinding bolts for the automobile industry.

A *Chcc Prs Qr/Chcz Prz Qr*

Automatic cutter grinder

Ingersoll Milling Machine Co, Rockford, Ill. *Tool Eng* 1959 Vol 42 (4) p 184 (Apr)

The machine will do a complete sharpening job on a wide range of milling cutters, grinding on the OD as well as on the face and bevel of any cutter within its 4 to 20 in. capacity. The spindle speed automatically increases to compensate for wheel wear, and the wheel is automatically trued with every stroke. A built-in dust collector is provided. 1 illustr.

W *Alc Chc Pr*

Successive grinding cuts—do they affect residual stresses ?

L. M. Kubsh. *Machinery* (NY) 1959 Vol 65 (8) pp 116-119 (Apr)

Research into the stresses produced in metal parts after grinding operations is discussed. The tests undertaken and the results obtained are described. Stress effects are not cumulative from successive cuts, and feed and wheel sharpness are important factors in producing quality parts. 3 illustr.

F *Bf Chc Unq.131*

On the whear [sic] of grinding wheels

J. Koloc. *Microtecnic* 1959 Vol 13 (1) pp 12-15 (In English)

Wheel wear in relation to time and conditions for self dressing or dulling is discussed. It is shown that there are two phases in wheel wear, the first being fundamentally influenced by feed rate and form of the truing diamond, the second being more or less linear with relation to time. The conditions under which self-dressing would take place are examined, and it is claimed that under present conditions most cases of grinding ferrous materials are done in the dulling range. 9 illustr, 1 ref.

F *Chc Pe Unr*

Determining the angle for positioning grinding wheels used in slant grinding of cutter tooth faces

A. F. Kuvyrdin. *Nauch trudy MLTI* 1956 (6) pp 62-71 ; *Library of Congress Mthly Index Russ Access* 1959 Vol 11 (12) p 3790 (Mar) (Original in Russian)

W *Az Chcz Pe*

The honing process for abrading gear wheels after tempering. Le procédé ' honing ' de traitement par abrasion des engrenages après trempe

Y. Laure. *Rev Gen Mecan* 1958 Vol 42 (113) pp 363-365 (July-Aug) (In French) ; *Macchine* 1959 Vol 14 (4) pp 407-408 (Apr) (In Italian)

The purpose of honing is to improve surface finish, to eliminate burrs, to plane off irregularities of the metal due to shock, thus eliminating hand-finishing with a grinding stick, and finally to correct small distortions due to the tempering. The process is used for straight and helical gears. The machine described is manufactured by the Broach & Machine Co, Detroit, Mich, and can produce a finish of 2.5 micron. 2 illustr.

A *Az Chh Vj*

Speedy removal of burrs and grinding and polishing of mass-produced parts with controlled oscillation. Beschleunigtes Entgraten, Schleifen und Polieren von Massen- und Serienteilen mit geregelten Schwingungen

B. Hagelueken. *Ind Anzeig* 1959 Vol 81 (31/32) pp 478-480 (Apr 21) (In German)

A *Az Chc/Az Chm*

New opinions on grinding and polishing, especially of metallographic specimens. Neue Gesichtspunkte beim Schleifen und Polieren metallographischer Proben

Z. Ministr. *Hutnik* 1956 Vol 6 (9) pp 257-262 ; *Ind Diamond Rev* 1958 Vol 18 (206) pp 7-10 (Jan) ; (207) pp 26-28 (Feb) ; abstr *Werkstattstechnik* 1959 Vol 49 (4) p 215 (Apr) (Original in Czech, *IDR* in English, abstr in German)

A *Bfa Chc/Bfa Chm*

Vibratory polisher

Nash & Thompson. *Metallurgia* 1959 Vol 59 (354) p 212 (Apr)

A vibratory polisher for metallographic specimens is described. A nylon cloth, mounted on a glass plate and impregnated with 6 micron diamond paste, is used for polishing. Twelve and more specimens can be prepared simultaneously. Finishing is carried out with 1 micron diamond dust.

F *Bfa Chm Km Pr*

Automatic grinder speeds tap production

Newall-Keighley. *Metalworking Prodn* 1959 Vol 103 (18) pp 772-773 (May 1)

The model ANL automatic tap grinder is designed for high-speed quantity production of small taps and other threaded components up to ½ in. diameter. All machine functions, including work loading and unloading, sizing control, and wheel truing, are fully automatic. 4 illustr.

W *Az Chc Prs*

Mist cooling up-to-date

P. A. Moline. *Machine & Tool Blue Book* 1959 Vol 54 (4) pp 105-109 (Apr)

The advantages of mist coolant systems in various machining operations are described. Mist coolants used with diamond wheels can increase wheel life by more than 100%, with faster cutting and improved visibility. 7 illustr.

W *Ceq Nv Uqfb:Qs Sjg*

Examining the structure of materials. Esame delle strutture dei materiali

L. Orsini. *Macchine* 1959 Vol 14 (4) pp 389, 391-393, 395, 397, 399, 401, 403, 405 (Apr) (In Italian)

Preparation of metallographic specimens for microscopic tests includes special polishing techniques. 31 illustr, 4 tables.

M *Bfa Chm Vj*

Abrasive sheets and belts

L. F. Spencer. *Met Finishing* 1959 Vol 51 (2) pp 52-57 (Feb)

The use of abrasive belts as a substitute for set-up wheels is increasing owing to several advantages in production. There are five distinct minerals used in the manufacture of coated abrasives for use in this field, *ie* flint or quartz. Turkish or American emery, garnet, aluminium oxide, and silicon carbide. The characteristics which are of most concern in the choice of abrasives include hardness, toughness, and fracture type. These characteristics are discussed in detail, along with the types of backing, coating, adhesives, storage of coated abrasives, and operating data. 2 tables.

A *Pee*

The use of synthetic diamonds for grinding sintered carbide. Einsatz synthetischer Diamanten beim Schleifen von Hartmetall

G. Pahlitzsch. *Werkstattstechnik* 1959 Vol 49 (5) pp 241-247 (May) (In German)

For grinding sintered carbide, grinding wheels impregnated with synthetic diamond boart are superior to natural diamonds, especially with regard to the quantity of abraded matter produced. The efficiency of performance depends, however, on the properties of the bond and the type of truing. The better performance of synthetic diamond derives from the sharper contours of the particles and their greater friability. A surface which has been finished with synthetic diamond is slightly rougher than one finished with natural diamond, but the difference becomes less with longer grinding. The properties of synthetic diamond are discussed and details are given of the grinding experiments performed. 18 illustr, 7 ref.

A *Bkc Chc Fc Nv*Bkc Chc Fh Nv*

Metallographic polishing

L. E. Samuels, M. Hatherley. *Journ Australian Inst Metals* 1958 Vol 3 (2) pp 111-123 (Aug); abstr *BNF Bull* 1959 Vol 39 (358) p 229 (May)

A discussion and survey of modern methods. Requirements of the surface; mounting specimens; preliminary machining and abrasion (cutting and machining, abrasive papers, fixed abrasive laps, microtome, taper sectioning); rough polishing (mechanical, electrolytic, chemical); fine polishing; defects in polished surfaces. 65 ref.

X *Bfa Ceq/Bfa Chm/Bfa Cr/Chm Unf.2591*

Thread grinding methods and their application

A. Schatz. *Progressus* 1959 Vol 40 (1) pp 17-18 (Feb) (In English)

A brief review is made of the chief thread grinding methods and the fields of application and accuracy obtainable. A photograph shows the diamond dressing attachment on the MSO Maschinen- und Schleifmittelwerke AG's universal thread grinding machine, which is used to transfer the V-groove form to the grinding wheels. 4 illustr. *A* *Chcp*

Dual machine speeds grinding

Van Norman Machine Co, Springfield, Mass. *Iron Age* 1959 Vol 183 (11) pp 132-133 (Mar 12)

The new machine combines crush-true and centreless techniques. Such machines have been in use in a number of shops for nearly a year, but lately a new development has been made, consisting of a unit which will take a ½ in. bar of high tensile steel, 30 RC, and cut it down to size in about 15 seconds. Rough grinding removes about 0.185 in. of stock, while the finish grinding takes off 0.010 inch. A finish of 20 microinches rms or better can be obtained. Automatic feed is possible, and the machine can be refitted for conventional diamond trued wheel operation if desired. 3 illustr. *A* *Chc Pr:Nj Psf*

Automatic cutting tool grinder. Automatische Messerkopfschleifmaschine

Montanwerke Walter AG, Tuebingen. *Werkstattstechnik* 1959 Vol 49 (4) p 208 (Apr) (In German)

1 illustr. *A* *Al Chc Prs*

The automation of finishing, its limits and possibilities. Die Automatisierung der Fertigung, Grenzen und Moeglichkeiten

C. Stromberger. *Werkstatt & Betrieb* 1959 Vol 92 (5) pp 225-234 (May) (In German)

22 illustr. *A* *Chm Prs*

Synthetic grinding agents, silicon-carbide and electrocorundum. Kuenstliche Schleifwerkstoffe, Siliziumkarbid und Elektrokorund

A. Schneider. *Radex Runds* 1959 Vol 1959 (1) pp 421-433 (Jan) (In German, abstr and summary in German, French, and English)

16 illustr, 6 ref, 2 tables.

A *Chc Rdf/Chc Rgc/Chc Rjc*

NEW MACHINING METHODS

Hungarian machines for electro-spark machining

G. Barna. *Machines & Tooling* 1959 Vol 30 (1) pp 21-22 (Jan) (In English, original in Russian)

3 illustr. *W* *Ceqm Pr*

Ultrasonic impact drill features automatic tuning, greater speed

Gulton Industries Inc, 212 Durham Ave, Metuchen, NJ. *Am Machinist* 1959 Vol 103 (8) p 159 (Apr 20)

The Glennite piezoelectric impact drill retunes automatically as impedance changes. The unit also slices, engraves, shapes, taps, broaches, dices, shaves, etc, and can be used on the hardest materials. 1 illustr.

W *Cfbk Pr*

Electrolytic grinding. Rettifica ed affilatura per azione elettrolitica

P. I. S. Leporatti. *Macchine* 1959 Vol 14 (4) pp 305-317 (April) (In Italian)

Survey of electrolytic grinding techniques and methods. 23 illustr, 18 ref, 3 tables.

M *Chcr*

Honeycomb cores—ground not milled

H. C. Murrer. *Grinding & Finishing* 1959 Vol 4 (10) pp 36-38 (Apr)

Stainless steel (17-7PH) honeycomb is electrolytically ground on an open side planer, using a 6 in. plate-mounted metal-bonded aluminium oxide wheel.

W *Bfd Chcr Pe Rj Urc*

Small size instrument for electropolishing and electroetching of microsections

L. Ya. Popilov. *Zavodskaya Lab* 1958 Vol 24 (7) pp 890-892 [Transl av, H. Brutcher, PO Box 157, Altadena, Calif. Price 18s 6d, No 4383] (Original in Russian)

W *Bfa Chmk Pr/Bfa Qlb:Pr*

POWDER TECHNOLOGY

Powder metallurgy

J. Lomas. *Machinery Lloyd* 1959 Vol 31 (7A) pp 39-41 (Apr 4) (In English, French and German)

A description of the compacting and sintering processes involved in the production of tools by powder metallurgy methods, and a survey of applications. Diamond-impregnated grinding wheels, core bits, and truing tools incorporate the diamond in sintered carbides, plastic metals, or alloys.

W *Al Cql Vwlb/Cql Nhe Vwlb/Cql Nj Vwlb/Cql Nv Vwlb*

Sine table for indexing powder patterns

J. D. H. Donnay, G. Donnay. *Am Mineralogist* 1959 Vol 44 (1/2) pp 177-179 (Jan-Feb)

4 ref. *W* *Uklf.213*

USP 2,854,736 (Jan 20, 1955) **K. M. Taylor, Carborundum Co**

Boron nitride-metal silicide bodies and the manufacture thereof

The bodies comprise boron nitride and refractory transition metal silicide, and solid reaction products of such nitride and silicide, including refractory transition metal boride. The transition metals are meant to be titanium, zirconium, hafnium, vanadium, columbium, tantalum, chromium, molybdenum, and tungsten. The bodies may also contain auxiliary metals or their reaction products with the other ingredients, *ie* cobalt, nickel, and mixtures thereof. A finely divided raw mix is produced which is then placed in a closed mould with a movable plunger; it is then hot pressed, heat and pressure being maintained until the downward movement of the plunger ceases. The bodies may be used, *eg* for abrasive articles for grinding and polishing, apart from high temperature applications. The bodies should contain a minimum of about 1% each of boron nitride and refractory transition metal silicide. (11 claims). Ref cited: 2 USP; see also USP 2,808,314.

J *Bfxz Qc*

TOOL PRODUCTION AND DIAMOND RECOVERY

Industrial minerals

J. L. Gillson. *Min Congr Journ* 1959 Vol 45 (3) pp 122-130, 145 (Feb)

The section devoted to diamonds gives details about the developments in the diamond industry in 1958, including mention of a method invented by the Diamond Research Laboratory of Johannesburg for recovering microscopic diamonds. A heavy mineral concentrate is treated electrostatically to concentrate the diamonds. The fine particles are collected in a mixture of bromoform and lead sulfamate, which has a specific gravity of 3.64, and in which the diamonds float so that they can be skimmed off.

GEC of America hope that the USA will become independent in industrial diamonds by producing synthetic stones by the high temperature, high pressure process.

A *F Hvm.131.361/F.25/F.13.341*

Machinable and hardenable cemented [sintered] carbides

Anon. *Engs Digest* 1959 Vol 20 (4) p 138 (Apr)

Steel-bonded carbides, *eg* tungsten and titanium carbide, can be machined by conventional means while in the annealed state (hardness 38 to 42 RC). After machining, oil quenching from 1,750 deg F in a medium oil imparts a hardness of 69 to 71 RC.

W *Bkc Ceq Unk*

Centrifugal separators recover diamond dust

Torit Mfg Co, Walnut & Exchange Sts, St Paul, Minn. *Steel* 1959 Vol 144 (10) p 70 (Mar 9)

Units requiring no filters, and mounted on the walls or on machinery, hung from the ceiling, or placed on tables, have been found to be satisfactory for recovering diamond dust at Tungsten Carbide Tool Inc, Detroit. The recovery is not practicable if the diamond particles are mixed with other materials. A by-pass arrangement in the ductwork is recommended, so that diamond and other abrasive wheels can be interchanged. 1 illustr.

A *Fw Hvm Prvc*

Dust collector

Torit Mfg Co, Walnut & Exchange Sts, St Paul, Minn. *Purchasing Week* 1959 Vol 2 (17) (Apr 27)

The model 90 cabinet cloth filter dust collector will remove 99.9% of all dusts, even with a high concentration of sub-micron size particles. Dust is collected in a pull-out drawer. 1 illustr.

W *Pr Prvc*

USP 2,853,066 (Apr 27, 1956) **J. Loecy jun**

Diamond tool for dressing grinding wheels, etc

Uneven wear of a truing diamond can be prevented by presenting from time to time fresh portions of the stone to the grinding wheel. Automatic devices for effecting such adjustments are not always feasible because of lack of space. A manual rotary adjustment can be carried out on a tool as shown in Fig 24. Shank

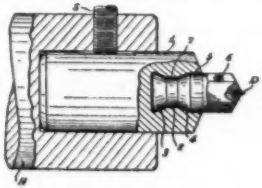


Fig 24. The truing tool, the manufacture of which is described in the Patent. USP 2,853,066.

1 is set in holder *H* where it is secured by screw *S*. The shank is applied to the truing tool (with diamond *D*) by casting, swaging, or spinning about the portions 2, 3, 4, and 5 which provide a grooved neck, while projecting portion 6 is made hexagonal so that it can be gripped by a wrench or spanner for truing the tool in the shank. In order to facilitate turning, the portions 2, 3, 4, and 5 may be provided with a coating of, *eg* graphite. A suitable material for the shank and the diamond tool body is beryllium copper. (6 claims, 2 illustr). Ref cited: 4 USP; 1 BP; see also USP 2,761,441.

J *Nj*

USP 2,858,256 (Oct 26, 1953) **F. Fahnoe, J. J. Shyne, Vitro Corp of America**

Electrophoretic method of making an abrasive article and article made thereby

Electrophoretic deposition results in exceptional uniformity of coating thickness and compacting as compared with conventional application (dipping, spraying, brushing). Irregular shapes can be coated with excellent uniformity and reproducibility, and the deposition can be precisely controlled, *eg* by voltage and spacing of electrodes. The liquid phase, *ie* the carrier for the charged particles, must be a non-conducting fluid. The coating can be composed of any abrasive material, diamond, silicon carbide, fused alumina, carbides, etc, used in colloidal dispersion. As a substrate, steel is preferred. Abrasive and bonding material are co-deposited. Compounds such as metal oxides (chromium oxide), metal carbonates (nickel carbonate), metal sulphates (copper sulphate), or metal halides (cobalt halide) may be used. For electrolytic deposition, chromium, nickel, and cobalt are suitable. For 'electroless' deposition, a bonding material like cobalt or nickel must be chosen. The article is formed by depositing abrasive particles on a precision contoured master, from which the particles are stripped after bonding. The articles may then be subjected to an etching procedure to expose the abrasive surface, or to a shrinking process. (19 claims, 8 illustr). Ref cited: 9 USP; 1 BP; 1 FP.

J *Bf Cz Pd/F Lfdd N*

New readers are advised to see the List of Publications, cover iii; several of the listed publications are available *gratis*.

SURFACE FINISH TESTING

Using reflected light to detect and photograph defects on polished surfaces

Anon. *Machine Shop Mag* 1959 Vol 20 (5) pp 263-267 (May)

8 illustr. *W* *Unf Vsb*

Exhibits of finishing interest at the Physical Society's 1959 Exhibition

Anon. *Prod Finishing* 1959 Vol 12 (3) pp 97-98 (Mar)

Two of the processes reviewed are a method of testing surface roughness and one for measuring thickness on tinplate. Both methods involve the use of instruments still under development by the British Physical Laboratories. The surface roughness measurer uses the Hall effect to produce an output potential proportional to its displacement caused by surface irregularities. This potential is then amplified and the indication of the roughness is shown on a 4 in. meter which may be an average or a peak reading as required by the operator. The range of roughness that can be measured is from 10 micro-in. to 0.01 inch.

A *Cx Wgf*

Some properties of spark-eroded surfaces

M. Barash. *Microtecnic* 1959 Vol 13 (1) pp 1-4 (In English)

Particular attention is paid to surface finish. 3 illustr, 5 ref. *W* *Ceqn Unf*

Finish tester

Engis Equipt Co, 431 S Dearborn St, Chicago 45, Ill. *Design News* 1959 Vol 14 (6) p 99 (Mar 16)

A portable, semi-automatic instrument has worktable, pick-up, stylus, and support combined with a motorized drive in one assembly which can carry small work in a universal holding fixture, or which can be fitted with special quick loading production tooling. The same units, inverted, can be used to check large flat or cylindrical work. The instrument is suitable for a wide range of surface finish precision testing. 1 illustr.

A *Cx Wgf*

On the technical value of surfaces, testing, and designation. Ueber den Gebrauchswert von Oberflaechen, Pruefung und Kennzeichnung

W. Dreyhaupt. *Industrieblatt* 1959 Vol 59 (4) pp 124-127 (Apr) (In German)

A *Cx Unf*

Surface finish and gauge accuracy of abraded bores. Oberflaechenguete und Masshaltigkeit geriebener Bohrungen

W. Junker. *Techn Runds* (Berne) 1959 Vol 51 (18) p 17 (Apr 24) (In German)

The quality of finish depends to a large extent on the surface finish and sharpness of the tool used. In Russian experiments it was found that the finish obtained on a bore with a diamond-finished tool was twice as good as that obtained on a similar workpiece with a reamer which had been finished on a silicon carbide wheel. Details are given concerning experimental work on the finishes of bores. 7 illustr.

A *Al Chc Nv/Al Chc Pe Rgc*

Interferometer for testing large surfaces

J. B. Saunders, F. Cross. *Techn News Bull* 1959 Vol 43 (3) pp 53-54 (Mar)

A description of a simple, sensitive interferometer for testing the flatness of large surfaces. 4 illustr.

W *Vs Wcr*

Roughness measurement in drawn or polished steel. Rauheitsmessung bei gezogenem bzw geschliffenem-druckpoliertem Stahl

K. Wenderlich. *Draht-Welt* 1959 Vol 45 (4) pp 213-215 (Apr) (In German)

The DIN standards are discussed, with reference to the different values to be taken into account when surface roughness is measured.

W *Bfd Cx*

MISCELLANEOUS

New machines

Anon. *Machines & Tooling* 1959 Vol 30 (1) pp 44-46 (Jan) (In English, original in Russian)

New Soviet machine tools, *eg* boring machines and grinders, are described. 5 illustr.

W *Cfd Pr.33/Chc Pr.33*

Specialized East German machine tools at the Leipzig Fair

Anon. *Machinery* (London) 1959 Vol 94 (2323) pp 913-922 (Apr 22)

14 illustr. *W* *Pr.322:.27*

Some developments in Czechoslovak machine tools and equipment

Anon. *Machinery* (London) 1959 Vol 94 (2422) pp 836-840 (Apr 15)

7 illustr. *W* *Pr.132.326*

The mechanical performance of machine tools. Le rendement mécanique des machines-outils

L. Champetier. *Machine-Outil Franç* 1959 Vol 24 (143) pp 77, 79, 85 (May) (In French)

1 table. *A* *Pr.21*

Measuring speeds on machine tools by electrical methods. Das Messen von Geschwindigkeiten an Werkzeugmaschinen mit Hilfe elektrischer Verfahren

H. W. Hahnemann. *VDI Zeits* 1959 Vol 101 (13) pp 535-536 (May 1) (In German)

2 illustr. *A* *Pr Uqf V*

What you should know about planing with carbides. I-III

H. W. Knox. *Carbide Engg* 1959 Vol 11 (2) pp 11-15 (Feb); (3) pp 15-19 (Mar); (4) pp 19-24 (Apr)

A comprehensive review of planing equipment, techniques, and tool geometry needed for the application of carbides to high speed planing operations. Elimination of vibration, speeds and feeds, and tools and toolholders are discussed, and a detailed examination of planer tool geometry is presented. Rough grinding of the carbides should be done with green grit silicon, and finish grinding with diamond wheels of 120 mesh or finer. Cutting edges should be honed with a silicon hone. 23 illustr.

W *Bk Cem/Bk Chc Pe Rgc/Bk Chct Nv*

Diamond tools

A. Landau Co. *Iron Age* 1959 Vol 183 (12) pp 137-138 (Mar 19)

A new catalogue contains descriptions of diamond tools for general and special applications, and information concerning the choice of the correct tool for a particular purpose. *A* *N.57*

TRADE LITERATURE

Diamond abrasive wheels, hand hones, lens laps, diamond dressing tools

Diamond Abrasive Wheels Ltd, 1291 Parker St, Vancouver, BC. 22 pp, 8½ × 11¼ in, illustr

The introductory information in Catalogue 758 covers ordering procedures, grades of bond hardness, use of coolant, explanation of symbols, typical uses of resinoid- and metal-bonded diamond wheels, and standard shapes available. The bulk of the catalogue gives illustrations and details of grinding wheels, truing tools, hand laps, and optical lens grinding laps available.

W *Nv Urb.57/Nv Urc.57*

Edco diamond dressing tools

Edco Tool Co, 93 Oak St, Wyandotte, Mich. 10 pp, 8½ × 11 in., illustr

Single stone (octahedron) truers are available in 10 carat sizes ranging from ¼ to 3 ct, and with a variety of shanks. A re-setting service is operated by the manufacturers. Faceset truers have from three to seven diamonds spaced over the face of the truer; they are particularly suitable for rougning work. Edgeset truers have either two or three diamonds set in a straight line and are used for truing wide faces. Layerset truers have a pattern of diamonds on the truing face which is duplicated several times throughout the matrix: as one layer is used up, another is exposed. Lineset truers have either three or four diamonds set vertically in line and operate on the same principle as the Layerset truer. Sliverset truers utilize a maccle diamond, *ie* long and slender, and are used for radius forming and similar work where a high finish is required. The Side-mount truer has a slim diamond mounted on the side of a shank and is suitable for truing fixtures such as the Majestic, the Vinco, and Perfex. Diamond tools for thread grinders complete the range of tools covered by this catalogue, which also contains tips on the truing process.

W *Chcp N.57/Nj.57*

Collected catalogues [Precision tools]

Louis Levin & Son Inc, 3610 S Broadway, Los Angeles 7, Calif

Small precision lathes and accessories for the jewellery, optical, and similar industries are covered. The accessories include diamond grinding wheels, diamond truing devices, diamond laps, and diamond lapping compounds. The equipment is particularly suitable for precision operations in the toolrooms and workshops of engineering factories.

W *Bb Ceq Pr*

Collected catalogues [Thread grinders]

Herbert Lindner GmbH, Berlin-Wittenau, Germany; British rep: Stedall Machine Tool Co, 145-157 St John St, Clerkenwell, London EC 1

'Standard' and 'Gus' worm and thread grinders are each available in four designs, although the basic features on each are identical. Single-rib grinding wheels are diamond trued by hand on Standard models and automatically on Gus models. The catalogue gives a comprehensive description of the machines, quoting working ranges, accuracies, dimensions, weights, and power requirements.

The FS500, GL2, and GL4 thread grinders are for long thread grinding operations, *ie* up to 13 ft plus. Wheel truing is automatic.

The GE thread grinder (catalogue available in English or German) is a high precision machine suitable for work up to 1 in. diameter by 7½ in. long; the maximum length of thread ground is 3½ inches. The single-rib wheel is diamond trued, and a wheel crushing attachment is provided for the multi-rib wheel.

W *Chcp Pr/Chcq Pr*

Diamond industrial grinding tools

Sample Marshall Labs Inc, 63 Park Ave, Lyndhurst, NJ. 12 pp, 8½ × 11 in., illustr

The catalogue is principally concerned with a variety of diamond wheels, *eg* helixing wheels and cut-off wheels, but it also shows diamond countersinks, diamond core drills, diamond files, conical diamond hones, Flexolap diamond-impregnated laps, and special wear parts. The tools are shown both in operation and diagramatically.

W *N.57*

Collected catalogues [Diamond tools]

Sample Marshall Labs Inc, 63 Park Ave, Lyndhurst, NJ.

The Sample Marshall range of diamond saws for reinforced plastics uses coarse mesh diamond particles which project from the bond to a degree that will prevent loading over long periods of operation. Dressing is not required as a solvent cleanser will keep the diamond area clean. Peripheral speeds of 10,000 surface ft/min are recommended. Grinding wheels, drills, countersinks, and routers in special or standard shapes are available for use on similar materials.

Also available is the diamond-plated foil for filling special cutting needs. This is produced in several mesh sizes in dimensions up to 6 × 6 inches.

W *Bpr Cej Nt*

Diamond grinding wheels Winter K-plus. Diamant-Schleifscheibe Winter K-plus

Ernst Winter & Sohn, Hamburg 19. 1 p, 8½ × 11¼ in. illustr. (In German)

K-plus grinding wheels are made in many sizes and consist of a resin bond with either natural or man-made diamond particles. Ewusol extra is recommended as a coolant for wet grinding, which is essential where ceramic is the material being worked. Profiles show a selection of wheels and hand laps available.

A *Nv Urb.57*

RUSSIAN PUBLICATIONS OF INTEREST

The following Russian publications are available from Blackwell's, Broad Street, Oxford, England, at the price indicated in parentheses:

An investigation into the wear of cutting tools with the aid of radioactive isotopes, by G. P. Nadeinskaya, 161 pp. (6s + 1s 6d UK postage or 2s overseas postage).

High speed cutting of metals with greater feed, by N. I. Reznikov, 135 pp. (3s 6d + 1s 6d UK postage or 2s overseas postage).

Laboratory metallography, by E. V. Panchenko, 695 pp. (15s + 2s 6d UK Postage or 4s overseas postage).

Drill bits, by K. E. Korneev and P. A. Palli, 211 pp. (9s + 2s UK Postage or 3s overseas postage).

PATENT LISTS

BRITISH

The Official Journal (Patents) 1959 (3659) (Apr 2)

813,910 GEAR GRINDING MACHINE CO. Liquid-cooled grinding wheel assemblies.

813,870 MURFIN, W. H. (trading as WARRIS & SONS, G.). Grinding wheel dresser.

The Official Journal (Patents) 1959 (3662) (Apr 22)

815,090 SPARCATRON LTD. Electric disintegration of conductive materials.

815,093 MINNESOTA MINING & MANUFACTURING CO. Abrasive wheels.

815,156 VEB TRANSFORMATORENWERK K. LIEBKNECHT. Apparatus for grinding balls.

UNITED STATES

Official Gazette 1959 Vol 740 (1-5) (Mar)

2,875,557 P. R. HEYMES, SA DES MANUFACTURES DES GLACES & PRODUITS CHIMIQUES DE ST-GOBAIN, CHAUNY & CIREY. Apparatus for surfacing glass.

2,875,558 A. T. WILLIAMS, C. R. TIDLAND, TIDLAND MACHINE CO. Doctor blade grinder.

2,875,559 L. GARRISON, OLIVER INSTRUMENT CO. Method of grinding and grinding wheel therefor.

2,876,085 T. HORIE. Process for producing grinding materials.

2,876,086 A. R. RAYMOND, MINNESOTA MINING & MFG CO. Abrasive structures and method of making.

2,876,087 C. S. WEBBER, NORTON CO. Coated abrasives.

2,876,386 G. FEFER, D. W. RUDDORF, M. G. SUD, SPARCATRON LTD. Electric disintegration of conductive materials.

2,877,103 R. O. LANE, M & M RESEARCH & DEVELOPMENT CO. Artificial abrasive articles.

2,877,104 N. P. ROBIE, ELECTRO REFRACTORIES & ABRASIVES CORP. Abrasive material and method of making same.

2,877,105 J. B. SMITH, NORTON CO. Vitrified-bonded grinding wheel with fine hard sides.

2,877,606 F. H. LJUNGGREN, BRYANT CHUCKING GRINDER CO. Automatic sizing mechanisms.

2,877,758 A. F. FASSNACHT, A. R. JONES, SHEFFIELD - CLEVELAND CORP. Machine tool.

2,877,985 G. A. M. PETERSEN. Hard tip pilot bit.

2,877,988 H. M. CAMERON, E. S. WASSEL, AMERICAN COLDSET CORP. Drill bit with driven auxiliary bit.

2,878,111 R. S. DANIELS, A. J. MOSTELLO, UNION CARBIDE CORP. Water resistant abrasive structures.

2,878,171 M. FERRAND. Method of manufacturing abrasive surfaces by electro formation, and the products obtained thereby.

2,878,567 T. HOFMAN, C. W. HOFMAN. Apparatus for cutting spectacle-glasses.

2,878,638 P. E. R. FAUVELOT, ETABLISSEMENTS ED JAEGER. Sound-proof and shock absorbing bearing for percussion mechanism.

2,879,037 N. E. WOLFRAM. Rock drill bit.

2,879,630 A. AEPPLI, MAAG-ZAHNRAEDER & MASCHINEN AG. Grinding of gear wheels.

2,879,633 E. G. GAGE, GILBERTVILLE WOVEN LABEL CORP. Sharpening device for cutting wheel.

2,879,676 M. BURKHARDT, E. GRAFRIED, G. RAUNECKER, W. C. HERAEUS GmbH. Manufacture of spinning nozzles.

2,879,973 D. S. SACHSMAN, KENNAMETAL INC. Percussion drill bit.

2,880,080 W. J. RANKIN, B. F. TUNGSETH, MINNESOTA MINING & MFG CO. Reinforced abrasive articles and intermediate products.

2,880,081 W. R. EUBANK. Honing stone and method of making.

SOUTH AFRICAN

Official Journal 1959 Vol 12 (8-12) (Feb-Mar)

4284/58 INGENIEURBUERO DIPL-ING FRIEDRICH HEINRICH FLOTTMANN, F. H. FLOTTMANN, H. MATTNER, I. OESTERLING, K. BISCHOFF. Rock drill with central flushing.

3946/57 C. J. GUIJKERS, INDUSTRIAL DISTRIBUTORS (1946) LTD. Setting of non-metallic bodies in metallic bases.

AUSTRALIAN

Official Journal 1959 Vol 29 (4-7) (Feb-Mar)

219,759 NV PHILIPS' GLOEILAMPENFABRIEKEN. Spark cutting electrode.

219,960 A. CORBIN. Apparatus for cutting stone.

219,995 BRITISH ALUMINIUM CO LTD. Dies and manufacture thereof.

SWISS

Patentliste 1959 (3) (Feb)

336,137 G. E. BROMBERGER, ATELIERS DE CHARMILLES SA. Machine for machining a workpiece of conductive material by means of electric sparks.

336,203 A. STEIDINGER, PERPETUUM-EBNER FABRIK FUER FEINMECHANIK UND ELEKTROTECHNIK STEIDINGER & CO KG. Device for setting the needle in disk changers for disk records.

336,244 E. WILDHABER, C. B. KING, GLEASON WORKS. Method of cutting gear wheels without generator, machine for carrying out the method, and gear wheel made according to this method.

336,285 O. SCHEUBECK. Radius grinding apparatus.

336,287 L. O. CARLSEN, W. C. CRITCHLEY, GLEASON WORKS. Truing device for wheels with at least two truing tools.

336,311 F. BEROUD, F. CHAPATTE. Machine for making a hole with curved or tapering side walls in fine stones for horology and general industry.

FRENCH

Bulletin Officiel 1959 Vol 76 (3905-08) (Mar)

1,083,986 HERMINGHAUSEN - WERKE GmbH. Device for centreless grinding.

1,184,830 WAGNER & ENGLERT GmbH. Grinding wheel and its method of manufacture.

1,184,883 H. HEINLEIN. Device for securing cutting tips on cutting tools.

1,185,101 W. E. SYKES LTD. Grinding machine.

1,185,705 SKANDINAVISKA GRANIT AB. Machine for sawing stone.

1,185,741 SEITZ & CO. Shock absorbing bearing.

1,186,166 F. J. MILLAR, E. L. GOTHIER, MINNESOTA MINING AND MFG CO. Abrasive non-rigid rotary structures and their method of manufacture.

1,186,792 SOC NOUVELLE DE SONDAGES 'BONNE ESPERANNEE'. Drilling crowns.

GERMAN

Patentblatt 1959 Vol 79 (12-15) (Mar-Apr)

Applications Open to Public Inspection

1,053,446 B. KURTZ. Two-wing rotary drill with hard metal tips for drilling minerals and the like.

1,053,447 D. W. HAGLUND, SANDVIKENS JERNVERKS AB. Hard metal body for rock drills with a zone of harder and a zone of less hard but tougher hard metal.

1,054,305 K. HERTEL. Tool for chip producing machining.

1,054,344 R. TOUVAY, SA DES MANUFACTURES DES GLACES & PRODUITS CHIMIQUES DE SAINT-GOBAIN, CHAUNY & CIREY. Device for the simultaneous grinding of both sides of a continuously moving ribbon of glass.

1,054,870 H. KRUG, DISKUS WERKE FRANKFURT AM MAIN AG. Mounting of grinding bodies, in particular face grinding wheels, on their supporting disk.

1,054,871 H. WALKLING, SCHUMAG SCHUMACHER METALLWERKE GmbH. Rigid support for tool spindles, in particular for centreless grinders.

1,053,391 K. H. SCHULTZE, HERBERT LINDNER GmbH. Device on thread grinding machines for feed adjustment and adjustment for compensating backlash.

1,055,392 J. H. BODDEN, W. WORTMANN. Machine for grinding the cylindrical outer face of a packet of grinding wheels clamped on a mandrel between flanges.

1,055,394 H. WORM, FA HANS WORM. Measuring control device for a tool, in particular for surface grinders.

1,055,432 E. HEDIGER, CARBORUNDUM CO. Body of crystalline silicon carbide and method for its manufacture.

ABSTRACT NOTIONS

Trade literature for you . . .

Trade literature reviewed in *Industrial Diamond Abstracts* is *not* available on loan. Readers wishing to obtain copies should contact the manufacturer whose address is shown at the beginning of the review.

. . . and for us

In order that readers may be kept informed of developments in the industrial diamond and allied industries, manufacturers are requested to send review copies of their trade literature to: Industrial Diamond Information Bureau, 2 Charterhouse Street, London EC 1.

A short cut . . .

Our librarian receives many requests from America for the originals of articles that have appeared in the American trade papers. A delay is thus caused as the librarian has to contact the American journal concerned in order to pass on the request. Two trips across the Atlantic could be avoided if American readers would apply direct to the journal in which they are interested.

. . . and a close shave

The Industrial Diamond Trade Names Index is now in preparation. Those firms who have not yet returned their forms are reminded that there is not much time left in which to do so: a delay in returning the form could result in the firm's name being missed from the Index.

IDR REPRINT SERVICE

The following Reprint is now available from Industrial Diamond Information Bureau, 2 Charterhouse Street, London EC 1, at a charge of 1s, post free:

C 97 — Why x-rayed diamond tools? by V. Palen (*Tooling & Prodn* 1959).

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The Industrial Diamond Information Bureau is included in the Diamond Research Organization of Industrial Distributors (Sales) Ltd (incorporated in the Union of South Africa), together with the Diamond Research Laboratory in Johannesburg.

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Patent Abstracts

Patent lists are prepared from official patent journals of the major industrial countries, and patent abstracts in general from the printed patent specifications. Printed copies of British patent specifications accepted may be obtained from the Patent Office, Southampton Buildings, London WC 2, at 3s each. Numbers given under British applications for patents are for reference in all correspondence up to acceptance of the complete specification.

The following abbreviations are used :—BP for British Patent, USP for United States Patent, DAS for German Patent Application, DBP for German Patent (GP for German Patents issued prior to 1950), FP for French Patent, Canad P for Canadian Patent, and RP for Russian Patent.

Supply of Literature †

1. **Loan Service :** much of the literature abstracted in this journal is available in its original form, and can be borrowed for a period of fourteen days (in Great Britain only).

2. **Reprints :** copies of certain selected articles on industrial applications of diamond are available and can be supplied on request at a charge of 1s each, post free. New reprints are announced from time to time in this journal, and a classified list of reprints, dated September 1958, is available free on request.

Technical Information

The Bureau offers the resources of its considerable literature holdings to those seeking specific information on diamond tool and similar applications. Problems requiring fuller technical assistance can be referred to the Diamond Research Laboratory, Johannesburg.

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INDUSTRIAL DIAMOND INFORMATION BUREAU

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LIST OF PUBLICATIONS, JUNE, 1959

***INDUSTRIAL DIAMOND ABSTRACTS:** Issued monthly, from 1944 onwards, about 20 pp, 7⅞ x 9¾ in. Surveys technical, scientific, and patent literature.

***LIST OF PERIODICALS—BIBLIOGRAPHY OF INDUSTRIAL DIAMOND APPLICATIONS:** Alphabetical, 8 pp, 7⅞ x 9¾ in., Sep 1955.

***LIST OF PERIODICALS IN THE INDUSTRIAL DIAMOND INFORMATION BUREAU LIBRARY AT MAY 31, 1958:** Alphabetical, 8 pp, 7⅞ x 9¼ in. A list of periodicals available for loan from the Industrial Diamond Information Bureau Library. This does not replace *List of Periodicals* (above), which is a list of periodicals abstracted in *Industrial Diamond Abstracts*, many of which are not held by the Library.

***IDR REPRINT SERVICE :** Classified, authors' index, subject index of groups, 12 pp, 7⅞ x 9¾ in., Sep 1958. (Reprints 1s each, post free).

***THE DIAMOND RESEARCH LABORATORY:** 16 pp, illustr, 11 x 9 in. Rev ed, 1956.

SELECTED BIBLIOGRAPHIES:

* **Truing of grinding wheels** (from 1910 to 1951). 39 pp, 7⅞ x 9¾ in. 3rd rev ed, Feb 1952.

* **Diamond as cutting tool for metals and non-metallic materials.** 24 pp, 7⅞ x 9¾ in. 2nd rev ed, Nov 1950. Name index, 1951.

Hardness and hardness testing (from 1937 to 1955). 118 pp, name index, subject index, 7⅞ x 9¾ in. 1955-56. Price 5s 6d.

DIAMOND TOOL PATENTS (Patent Monographs)

IA: Machining metals and non-metallic substances, by P. Grodzinski, W. Jacobsohn. 2nd rev ed, 55 pp, 7⅞ x 9¾ in. Apr 1949. Price 10s.

II, IIs: Diamond abrasive wheels, by P. Grodzinski. 74 pp, 4 tables, name index, 7⅞ x 9¾ in. Aug 1948/49. Price 13s 6d.

III, IIIs: Truing of grinding wheels, by W. Jacobsohn. 133 pp, 82 illustr, name index, 7⅞ x 9¾ in. Dec 1948/49. Price £1.

IV: Polishing of gem diamonds, by W. Jacobsohn. 40 pp, 83 illustr, 1 table, name index, 7⅞ x 9¾ in. December, 1950. Price 12s 6d.

IA to IIIs available as compilation in Spirollo binding, price £2 9s.

THE PRINCIPLES AND DESIGN OF A NUCLEAR RADIATION COUNTER WHICH USES A DIAMOND AS ITS DETECTOR, by W. F. Cotty. 18 pp, illustr, 7⅞ x 9¾ in. Oct 1956. Price 2s 6d.

DATA SHEETS FOR THE DIAMOND TOOL DESIGNER AND MAKER—Definition and designation of angles: Comparison of names for tool angles: Plane of chip flow: Clearance and rake angles: Minimum clearance for diamond boring tools: Economic layout of tool tips: Height position of turning tools: Accepted standards. 1945, reprinted Oct 1956. Price 5s.

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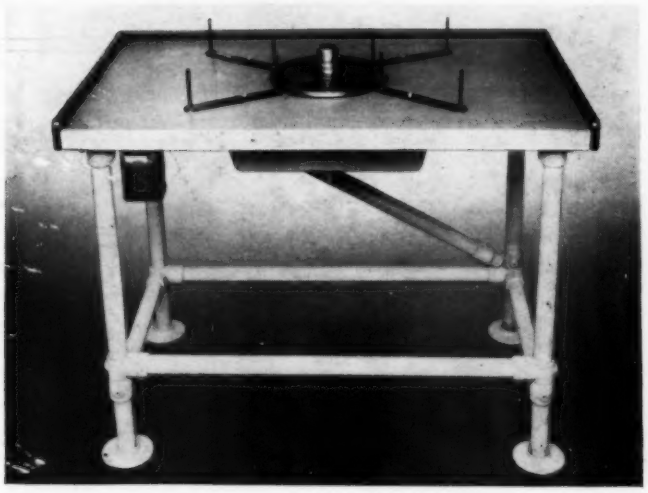
* *Publication free of charge.*

'HABIT' DIAMOND POLISHING MILL



A New approach to an ancient skill

The Habit Table is of heavy, solid construction to absorb vibration from internal and external sources and provide an absolutely flat working surface which will not warp or twist. It is carried on a strong tubular framework with adjustable legs which make special foundations unnecessary. In fact, there are no installation costs—just plug in to the electric supply and work can commence immediately.

FEATURES OF THE HABIT POLISHING BENCH INCLUDE :

- Economy of floor space, due to built-in drive unit.
- Clear working area free of overhead obstruction.
- Supplied with the internationally famous De Winter Scaife.
- No balancing of scaife required.
- Scaife always parallel to table within .002" (0.05 mm.)
- Trouble free bearings, fully sealed against entry of dust, require lubrication only twice yearly.
- Jointless long-life flat drive belt.
- Dead flat table top enabling mechanical dops and simple or complex fixtures to be employed.
- No corners or crevices to conceal dislodged diamonds.
- Adjustable feet to accommodate uneven floors.
- Easily dismantled for economical transport and shipping.
- No installation costs—just plug in.

DIMENSIONS AND SPECIFICATIONS

Table area:	28" x 48" (711 mm x 1219 mm.)
Height of table from floor:	36" (914 mm.)
Floor space required:	28" x 48" (711 mm. x 1219 mm.)
Electric motor:	1 H.P. 3 phase A.C. 1 phase A.C. or D.C. as specified.
Switchgear:	Push button overload trip type and isolator.
Scaife speed:	2,500 r.p.m.
Standard equipment:	1 De Winter Scaife. 4 Tang retaining stops. 1 Spirit level. 1 scaife level gauge.

HABIT DIAMOND TOOLING CO. LTD., Lurgan Avenue, London, W.6.

Telephone : FULHAM 7944.

'HABIT'

a journal for precision engineers and all users of industrial diamonds and other hard materials

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